

AT LAST — LOW-COST WAYS TO GET ONTO THE INTERNET

# AUSTRALIAN communications

OCTOBER 1994

The Networking and Telecommunications Management Magazine

\$5.50

## WALKING THE CABLING TIGHTROPE

How quality management can provide a safety net

### NETWORK RESALE

The telecoms revolution  
rolls on

### FDDI ADAPTORS

A sure cure for the  
bandwidth blues

### CASE STUDY SPECIAL

How the University of South  
Australia got connected

### LAN STORAGE

Why hierarchical storage  
management is the key



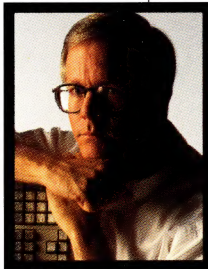


In the beginning, there was the mainframe. And no one took it anywhere. Life was much simpler.

Then came the mini. The workstation. The PC. The portable. The laptop. The notebook. The subnotebook. And finally, the PDA.

If this evolution tells us anything, it's that more and more of your critical computing resources are regularly going out the door.

Now, you probably don't have a lot of middle-level executives



♦ ♦ ♦  
*When it comes to remote computing, Peter Norton is way out in front of the pack. With the best selling remote access software package for both the DOS and Windows computers.*

offices. Even if their offices are just data sites on a vast virtual landscape somewhere on-line.

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they're out on the road or just a few steps down the hallway.

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Your users can work with all of your DOS, Windows and network applications and print to both host and remote locations as well as their choice of network printers.

And when it comes to data file transfers, pcANYWHERE is simply unmatched.

Users can transfer files in the background while working on

# REMOTE COMPUTING THAT GOES FAR AND PSEUDO-EXECUTIVES

faxing reports from a beach. Or traveling sales people tucking in their babies over airport video phones.

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pcANYWHERE enables your remote users to access their desktop workstations and LANs just as if they were sitting in their



♦ ♦ ♦ ♦ ♦  
*Forget about the fancy television commercials, the wild hype, the empty promises. More often than not, remote computing means a crowded airplane, a lonely motel room and a grueling schedule. You and your users need a realistic solution to the problems of remote access and pcANYWHERE is definitely the answer.*

♦ ♦ ♦ ♦ ♦  
automated. Login is simple via an auto-dial directory with an easy and intuitive interface.

You'll find support for both serial and direct modem ports.

And pcANYWHERE supports

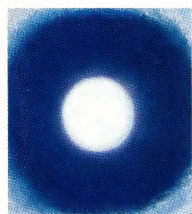
♦ ♦ ♦ ♦ ♦  
other projects. They can create, edit and delete directories and easily tag files for transferring. They can send and receive data files using XModem, YModem, ZModem and ASCII file protocols.

Symantec is a registered trademark and pcANYWHERE and Norton Administrator for Networks are trademarks of Symantec Corporation. All other trademarks or registered



What's more, pcANYWHERE gives you 15 different terminal emulations, including IBM 3101 VT220 and VT52, to name a few.

In addition, pcANYWHERE gives you the most advanced scripting language available in a remote software program. It puts over 100 scripting commands at



◆ On the road, late at night, you and your users will be glad you chose pcANYWHERE. And so will your upper management: payback is substantial and fast. ◆

manager. Drive mapping between host and remote PCs to reduce the hassles of file transfers and synchronization. And a new bi-directional gateway that reduces the need for additional network modems.

Of course, whenever anyone is dialing into your network, security is an issue. A very big issue.

pcANYWHERE has the lock on that, too. With the most comprehensive set of security features found on any remote program. There's password protection, data encryption, the

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All Norton Network Series products work together to help you manage all of your end-user resources centrally, from a single console on one desktop.

Today, they share one central command console with a single user interface. Tomorrow, they'll share data between applications.

So an antivirus intervention can automatically trigger a backup file restoration to the affected site.

A new software upgrade can

# BEYOND PICTURES OF PALM TREES FAXING FROM THE BEACH.

your fingertips. So you can design and automate your company's remote access exactly as you want.

## PCANYWHERE PUTS YOU IN COMPLETE CONTROL.

You can set up unattended sessions, transfer data files, run applications, control hardware settings, as well as terminal settings and even loops between your pcANYWHERE scripts.

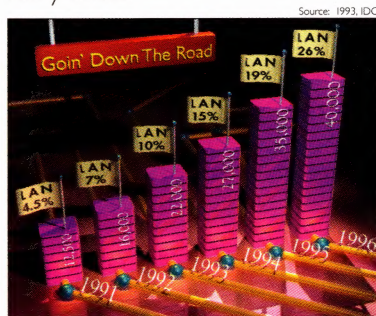
And there's a built-in log to help you keep track of users, their usage and your investment.

It monitors and records who called, how many modem calls were received and the duration of every call. It even enables you to record and playback entire remote sessions. So you can plan and forecast the support your remote users will need.

And our new DOS version has several enhancements to make every remote session faster and more productive.

Like data compression that improves performance by up to 20%. An improved memory

ability to restrict data access, blank the host screen, lock the host keyboard, change host hardware settings, set login attempt limits, and limit the number of password retry limits.



◆ Mobile computing is the fastest growing segment of the PC industry. Yet, just a few years ago, less than 10% of your portable users were on the LAN. By 1996, nearly 25% of your portable users will require LAN access. ◆

Beyond its own phenomenal functionality, pcANYWHERE is a Norton Network Series product.

Which means it'll completely integrate into the Norton Administrator for Networks™ and with other Norton Network Series products, to help you more effectively manage all of your end-user resources.

automatically trigger an updated network-wide inventory report.

Application usage from a remote login will automatically update your site license metering.

Together these products will help you manage your resources more effectively. So you can focus on building a reliable, responsive, information-rich network that will make your company more profitable and more competitive.

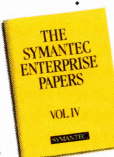
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And save your company money in the process.

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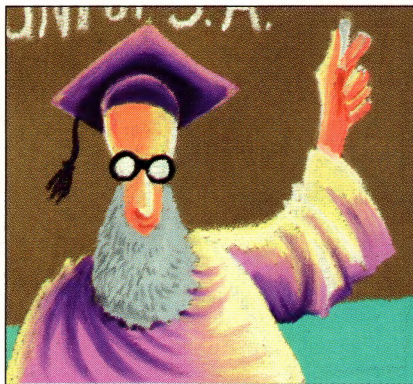


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# AUSTRALIAN communications

Cover: Eye For Design



## CABLING

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Strenuous efforts by international standards groups have brought order to the world of cabling and the great communications cabling standards battles that have raged around the world in recent years have now largely been fought and won. Few may be comfortable with the idea, but network managers can now select cabling and componentry from numerous vendors safe in the knowledge that it will be standards-compliant. So is the cabling nightmare now drawing to an end? Unfortunately, no. Trusting cabling components is not the same as trusting the cabling system. The challenge now is to bring the quality management techniques employed in other industries to cabling installations.

## NETWORK CASE STUDY

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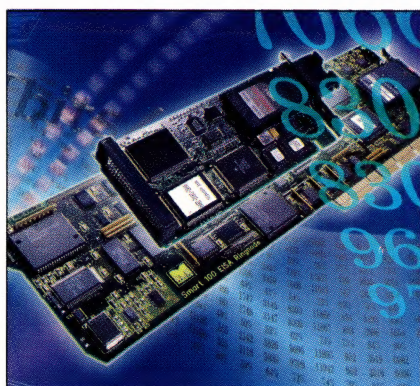
The University of South Australia was formed in 1991 from an amalgamation of the South Australian Institute of Technology (SAIT) and several campuses from the South Australian College of Advanced Education (SACAE). Amalgamations mean much more than printing new stationery — particularly for the communications network managers charged with meeting the requirements of the newly-formed entity. And so it was with the new university. In this special report, Consultel's Don McKellar and University network specialist, Stephen Stone, tell how the university went about merging the separate voice and data networks inherited from SAIT and the SACAE.

## RESALE

91

The resale revolution inspired by the reforms embodied in the *Telecommunications Act, 1991*, has now well and truly taken hold. In a relatively short time a substantial new industry in resale and service provision has blossomed from a tentative early start and price discount wars are hotting up. The boom, which is leading to lower communications costs for those smart enough to cash in, has been encouraged by Vodafone and grudgingly acknowledged by Telecom and Optus. But as some resellers shift gear into higher value growth strategies, others are struggling for survival. Mark McDonnell takes a look at the dynamic telecommunications resale industry and the infighting which is now determining its future.





## FDDI ADAPTORS

99

With ATM, Fast Ethernet, and 100VG-AnyLAN just on the horizon, most net managers are looking forward to fast times on their LANs and internetworks. But for those who need a high-speed fix right now, there's one already tried-and-true option that's more than capable of delivering the bandwidth goods — FDDI. True, at the prices charged for most fibre adaptors, even makers of FDDI cards don't expect FDDI to make it to the desktop sometime soon. But with corporate backbones sagging under the weight of ever-growing volumes of LAN traffic, FDDI is worth a close look for anyone needing to break chronic bottlenecks in client/server networks. It may not be cheap, but it works, and it's available right now.

## ANALYSIS



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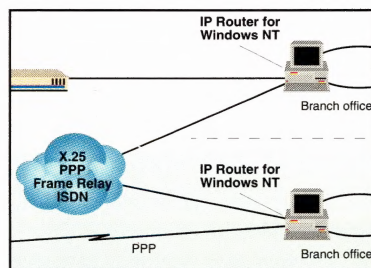
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Switch.NLM, Kalpana's new NetWare Loadable Module, can help boost bandwidth to the server.

### 56 Multiplying Access Choices

Telematics' new ACP 70 lets dollar-wise net managers pick and choose their WAN access methods.

## OPINION

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**69 Bill Melody**, Founding Director of CIRCIT, discusses the convergence of technology and the development of telecommunications policy.

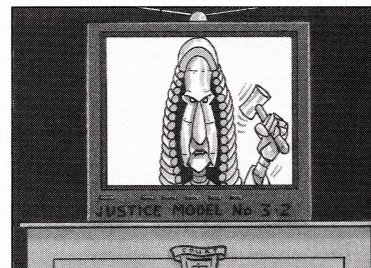
## INTERVIEW



### 59 John Riedl

Executive Chairman of leading Australian high technology developer, Jtec, John Riedl has long been at the forefront of the drive to promote the interests of indigenous manufacturers. He spoke with Liz Fell last month at Jtec's Sydney offices.

## LEGAL LINE



### 65 Multimedia and the Law

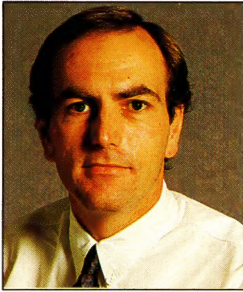
We are in a period of legal uncertainty, before changes to the law affecting multimedia become generally accepted as necessary. In the meantime, we apply old law which is often inappropriate.

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## How Much is Enough?



At about this time every year the same old question is raised: is Telstra's huge profit a good or bad thing? In the commercial world, corporations exist to make profits and maximise their worth to their owners. By and large, Telstra is increasingly meant to operate in a commercial way and so the obvious answer is that it's good; it demonstrates that the management and staff are performing as required. Particularly this year, when the carrier has turned in an Australian record corporate profit.

But of course things are not that simple. Telstra is meant to operate in a commercial fashion but its public ownership brings with it a wider responsibility to which it must adhere. That responsibility has always been closely associated with Telstra's duty to provide the best service it can to all Australians — its universal service obligation. Although the carrier is widely recognised to have performed satisfactorily in meeting this obligation, Communications Minister Michael Lee's recent disquiet about the number of Australians without ready and affordable access to a telephone service indicates that there is still much to be done. The question, as always, is how much money should be spent doing it? Does a record profit mean that tariffs are still too high? Does a record dividend to the Government mean that Telstra is simply an extension of the Tax Office? Is the reduction in capital expenditure last year an indication that more could have been done to extend services?

These questions and many others like them have always been difficult to answer and I suspect they won't get any easier as the clamour for universal broadband access gets louder in coming years.

*M Smeaton*

### In the November edition of *Australian Communications* ...

#### SWITCHED VIRTUAL NETWORKS

Today, router-based internetworking is the industry's stock in trade, but tomorrow's corporate enterprise will be based on third generation architecture: switched virtual networks. Next month we examine this new technology.

#### ISDN ROUTING IN AUSTRALIA

Routing has revolutionised internetworking and in Australia, ISDN is now increasingly being integrated into corporate nets. In our next edition we examine support for ISDN in Australia provided by router vendors.

#### ATM LAB TEST

Those expecting bandwidth to burn and blisteringly fast speeds when deploying ATM across a campus network may be in for a surprise. While ATM switches may be speed personified, ATM to the desktop is still in its infancy.

#### MESSAGING MIDDLEWARE

Middleware was supposed to make it much simpler to develop and deploy distributed computing applications. Unfortunately, so far this has not been the case. Next month we take a look at a new wave of middleware designed to fill the gap.

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## Telstra Posts Australian Record Profit

Defying increased pressure from Optus and unfavourable regulatory rulings, Telstra has turned in a record 1993/94 financial year, posting increased profits, a reduced debt loading and increased return on equity.

On revenues of \$13.4 billion, Telstra posted a pre-tax profit of \$2.528 billion, a massive 27% increase over 1992/93. Profit after tax and abnormal items came in at \$1.7 billion — claimed by the company as a new Australian corporate record. The result was achieved despite an average fall in prices of 4.5% and a 1.6% rise in expenses to \$10.8 billion.

Telstra CEO, Frank Blount, said that there had been further

improvement in key financial ratios, including the debt ratio, which has fallen from 42% to 36% after loan repayments and the conversion of some Commonwealth Government debt to equity. Return on equity rose to 18.3% from 15.1% in 1992/93.

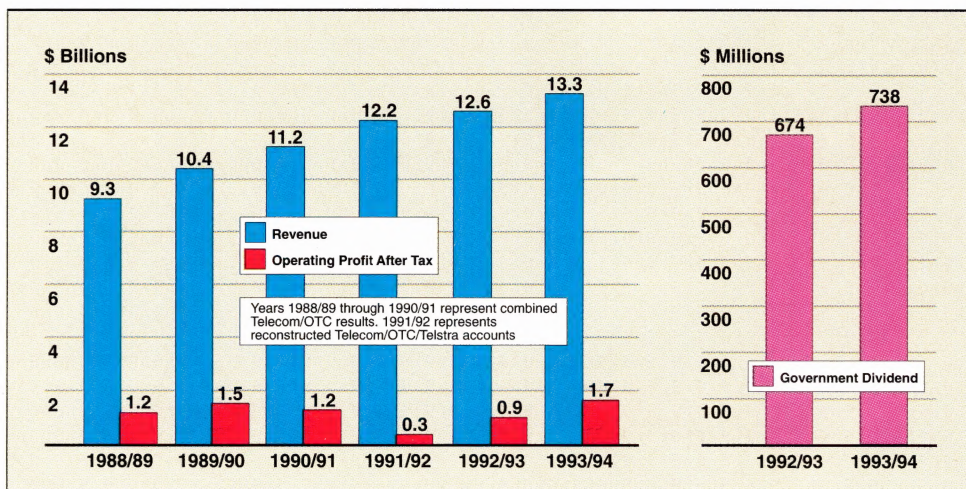
Surprisingly, capital expenditure fell from \$2.58 billion to \$2.46 billion despite over-budget expenditure on MobileNet to keep pace with demand. Network growth was 3.5%, bringing the number of telephone services in operation at the end of the year to 8.5 million.

Mr Blount forecast that capital expenditure this year would grow to \$3.5 billion as its Future Mode of Operation plans ramp

up. Network digitisation had now reached 51% and will be complete within five years, he said.

Telstra's increasingly scrutinised involvement wholly or partially owned local and international subsidiaries was not particularly fruitful. Dividends received from investments in controlled entities were a desultory \$3.1 million; while from associated companies they were a little better at \$8.1 million.

The Telstra Board has recommended an increased dividend of \$738 million. Together with income and indirect taxes, the dividend means that Telstra's total contribution to Government coffers for the 1993/94 year will be over \$2.2 billion.



## More Ericsson Mobile Orders

Ericsson's dominance of the carrier side of the mobile communications market has been reaffirmed following another supply order from Telecom and expansion of its existing major supply contract with Vodafone.

Telecom has placed new orders valued at \$126 million with Ericsson Australia for the supply of equipment to upgrade its AMPS and GSM networks. The majority of this equipment, including AXE switches and radio base stations, will be manufactured at Ericsson's Broadmeadows (VIC), plant.

From Vodafone, Ericsson has received advice that its existing \$200 million contract may reach \$240 million before its completion in 1996. Building on its relationship with Ericsson around the world, Vodafone's UK parent contracted Ericsson Australia to supply GSM switches, base stations and base station controllers early last year.

Ericsson claims to have captured a 40% share of the global mobile market. Company officials say the new orders in this country have caused it to boost its Australian workforce by 250 to 2,100 people since December.

## Stanilite, Scitec and NetComm Improve Performance

Leading communications equipment developers Stanilite Pacific, Scitec Communication Systems and NetComm have all recorded bolstered revenues and profits for the year ended June 30, 1994.

Stanilite, which is increasingly seen as one of Australia's key communications companies, reported a 32.4% boost in revenues to \$91.74 million and an after tax profit of \$9.13 million. This compares to 1991/92 revenues of \$50.1 million and profits of \$4.28 million. Research and development expenditure rose to \$9.8 million in 1993/94.

The company now employs 660 staff in 12 locations in six

countries. Its major activities last year as reflected in revenues were defence (43.7%) and telecommunications (36%). During the year it delivered the first external communications module for the Royal Australian Navy's ANZAC ship project and opened new markets in Africa, China, Russia, the Americas and the Pacific area. In Argentina, Stanilite installed over 90 cellular base stations and switches.

Scitec, which has seen troubled times in recent years, has returned to profitability by posting an operating income after tax of \$1.06 million. This compares to an operating loss before tax of \$17.5 million in 1992/93 which

the company attributed to intellectual property write-offs and the restructuring of its European operations. After falling from \$41.1 million in 1991/92, revenues rose by \$1 million to \$37 million last year.

Modem manufacturer NetComm posted an after tax profit of \$1.4 million on revenues of \$29.8 million. Managing Director, Chris Howells, says the company's share of the Australian market approached 45% during the year and sales volumes grew by around 38%. NetComm recently signed a new Japanese distribution agreement expected to earn the company \$5 million over the next three years.

## Jtec-QPSX Forge ATM Alliance

Leading high technology developers Jtec and QPSX have struck a deal to bring the significant strengths of both Australian companies to bear on new product development. Under the agreement, Jtec has purchased the designs and rights to QPSX's ATM chipset and associated software. In addition, Sydney-based Jtec will take over one floor of QPSX's Perth offices.

QPSX Managing Director, Peter Aberly, expects the deal to be the first in series with Jtec.

"Jtec's excellent technology [and] manufacturing facilities as well as its widespread network of sales, marketing and support offices makes them an excellent partner," he said.





Optus Chairman Sir Brian Inglis (far right) officiated at the MobileSat launch, held a short distance from Uluru in Central Australia

## MobileSat: Australia's World First

After eight years of development, MobileSat, Optus Communications' Australian-designed satellite-based mobile communications system, finally got off the ground in late August with all the fanfare such a world-first system warrants.

Officially launched by Communications Minister, Michael Lee, who placed a call from Canberra to Optus Chairman, Sir Brian Inglis, at Uluru in Central Australia, MobileSat will provide a mobile voice and data service which covers the entire continent and up to 200km off the coastline.

Dr Michael Wagg, who led the MobileSat design and development team, emphasised that the system could be used like any cellular telephone. But instead of the radio signals reaching the nearest cellular base station, MobileSat calls travel to and from Optus B-Series satellites 36,000km overhead via Optus's satellite earth station in Sydney. It operates in the L Band frequency spectrum between 1.5 and 1.6GHz and as well as voice, can transmit Group 3 fax and data at 2,400bps. The system can be used with a Global Positioning System (GPS) receiver to provide locational information and a short messaging service will also be available.

Unlike Telecom's rival Inmarsat-based Satcom-M service, Optus's MobileSat allows for truly mobile satellite communications. Mounted in veh-

icles, a MobileSat system supplied by NEC Australia costs around \$8,000 and includes a handset and cradle, transceiver unit and one metre tall rod antenna. NEC has spent four years developing its S1 Mobile Satellite Telephone and the company worked in conjunction with CSC Australia and Optus to provide MobileSat Network Management Stations in Sydney and Perth. Mitec and the CSIRO worked together to develop the special rod antenna.

MobileSat voice calls are tariffed between \$1.20 (off-peak) and \$1.80 (during peak hours) per minute and data transmission tariffs have now been set at \$1.60 (off-peak) and \$2.40 (peak) per minute to any destination in Australia. Voice and data services also attract a \$45 monthly service charge.

Already about one-third the cost of a Satcom-M system, Optus hopes that equipment prices will fall as additional manufacturers develop products for the system, which Optus hopes will attract up to 50,000 users.

US manufacturer, Westinghouse, has already announced that its Series 1000 Satellite Telephone System will be available for MobileSat users before the end of the year. Its products were designed to work with MobileSat-compatible systems scheduled to be launched soon by North American operators, American Mobile Satellite Corporation and Telesat.

## In Brief

**Optus's** Enterprise Flexibility Agreement (EFA), which covers 2,400 of its staff, has been approved by the Industrial Relations Commission. 89.1% of Optus employees voted for the EFA, despite a plea by the Communications' Workers Union to reject it.

**AMMA**, the Australian Modem Manufacturers' Association, has been established to represent the local modem manufacturing industry. Founding members include the seven major Australian manufacturers: NetComm, Banksia Technology, Dataplex, Interlink Electronics, Microfax Modems, Maestro and Simple Computing. The new group will operate under the umbrella of the Australian Electrical and Electronic Manufacturers Association.

**Pacific Dunlop** has announced the establishment of a new joint venture company to manufacture and market communications cables in Indonesia. PT Olex Indonesia will be 60% owned by Pacific Dunlop, with the remaining equity being held by a consortium of Indonesian interests. The company will construct a factory at Balaraja industrial park, 35 kilometres west of Jakarta.

**Iterra**, Telstra's high-end satellite communications product is being used by a consortium of oil exploration companies now operating in the Timor Sea. The Iterra system will provide high security communications services back to mainland Australia.

**Johanna Plante**, latterly of Pacific Star Communications and formerly an Austel Board Member, has now joined Telecom in the newly created position of Group Manager, Integrated Marketing.

**Optus** will invest \$20 million over the next 12 months developing a new long distance network in Tasmania. The network will include a radio-based synchronous digital hierarchy link between the company's Launceston exchange and Hobart earth station.

**B3**, Optus's new satellite was successfully launched from Xichang, China on August 28. The satellite will be placed in an inclined orbit for the next 12 months before replacing the Optus A3 satellite. A3 will replace A2, which will be retired from service.

**Austel** has disallowed Telecom's proposed Reachout 75 service because of its 'likely adverse impact on the development of competition.' Reachout 75 proposed to provide an untimed call charge of 37 cents for calls within a 75km radius of the local exchange from where the calling customer's service is connected.

**GEC-Marconi**, in conjunction with Telecom, has recently won a multi-million dollar contract to refurbish the Royal Australian Air Force's high frequency radio communications network.

**The Commonwealth Bank's** Institutional Banking Division has completed the first phase of its national dealing room upgrade project. Phase One of the project has seen the installation of Hewlett-Packard workstations for 189 dealer positions in Sydney.

**Optus** shareholder, Mayne Nickless, has taken a \$24.7 million loss on its investment in the carrier for the 1993/94 financial year. Mayne Nickless has a 21.25% stake in Optus Communications.

**Olex Cables** has received certification to the AS3901/ISO9001 quality standard for the design, supply, installation and commissioning of optical fibre-based communications systems.

**ISTV**, an Interactive Satellite Television network designed for the use of Victorian school and community groups, was launched last month. The \$3.8 million network links 2,500 school sites across Victoria via satellite to central studios.

**Telecom** has announced price cuts averaging 13% on its 2.4-Kbps to 19.2Kbps Lightstream and Bitstream leased line services to New Zealand. Ross Abbott, Telecom's International Portfolio Manager, claims the cuts represent the extension to customers of savings Telecom has achieved through increasing efficiency.

**JNA Telecommunications** has signed a \$1.4 million contract with Fujitsu Australia to develop and manufacture network terminating units. Company officials say the contract has the potential to lead to substantial follow-on sales.

**Vodafone** has granted a contract to KeyCorp to manufacture Subscriber Identity Module (SIM) cards for its GSM network.

**Optus** has secured a 12% share of Perth's telephone lines following the most recent round of preselection balloting. The company claims the result exceeded its 10% target.



## In Brief

**Phonelink**, the leading paging operator in Thailand, has selected Motorola's new FLEX paging infrastructure to upgrade its network. The awarding of the \$US2.7 million contract was based on Phonelink's belief that FLEX will be the paging protocol of the future, according to Operations Director, Thakolrat Keokarn. Motorola recently announced that Maxon America has become the ninth FLEX manufacturing licensee.

**Hong Kong Telecom** has signed a Memorandum of Understanding with Intel to resell Intel's ProShare personal conferencing products. Intel has a similar agreement with Telecom Australia.

**Ericsson** has recently won a new SEK620 million contract from Telekom Malaysia for the provision of RAS 1000 wireless local loop system. The three year deal is intended to provide a standard telephone service for 40,000 subscribers by 1995.

**Siemens** has caught up with Alcatel Alsthom as the largest telecoms supplier in the world, according to A&R, a Dutch market research firm. Siemens and Alcatel each achieved telecommunications sales of \$US12.3 billion in 1993, A&R reports.

**Novell** has named Robert J. Frankenberg Chairman of its board of directors. Installed as President and CEO after joining the company in April, Frankenberg, 47, was formerly Vice President and General Manager of Hewlett-Packard's Personal Information Products Group. He succeeds Ray Noorda.

**Alcatel Italia** has won a \$50 million contract to supply SDH radio links, on-line transmission systems and network management facilities to Eskom, the South African electricity board.

**Arianespace** has won out over General Dynamics and Russia's DB Salyut/Krunichev by winning the \$US66 million launch contract with its Ariane 4 rocket for Inmarsat's fifth Inmarsat-3 satellite. The new Inmarsat-3 satellites will be eight times more powerful than their Inmarsat-2 predecessors.

**MCI** has reported second quarter 1994 revenues of \$US3,309 million, or 13% more than the corresponding period last year. Earnings increased by 44% to \$US214 million for the period.

**LDDS Communications** has purchased US carrier Wiltel for \$US2.5 billion. Following its earlier purchase of the IDB Communications Group for \$US900 million, LDDS now has about 3% of the \$US64 billion long distance market.

**Tim Herring**, formerly Telecom MobileNet National Manager, has been appointed General Manager of Inmarsat's Land Mobile Division. Herring says he intends to prepare Inmarsat's burgeoning land mobile services product portfolio for the mass markets he expects to emerge by the turn of the century.

**Cisco Systems** has reported a massive 92% increase in sales to \$US1,242 billion for its 1994 financial year. Net income rose by 83% to \$US314.8 million and earnings per share to \$US1.19.

**Mobitex** mobile data technology employed by Facility Merchandising Inc. (FMI) processed nearly 77,000 credit card authorisation transactions during World Cup soccer matches in June and July. FMI used RAM Mobile Data's Mobitex network, which uses the same technology as BellSouth Mobile Data Australia.

**Nokia Telecommunications** has won a contract worth more than \$12 million from Singapore Telecom for the supply of transmission equipment. Nokia will deliver 8 and 34Mbps digital multiplex and optical line equipment over the next two years.

**Philips** has formed a strategic alliance with Omnipoint Corporation in the US to evaluate cable TV-based wireless networks in the personal communications services frequency band. The partners will soon establish a trial in New York using Omnipoint base stations integrated into Philips CATV distribution platforms.

**Cray Communications** has reported a boost in sales from £162 million to £244 million for the 1994 financial year. Terry Pethica, Chairman of Cray Communications Asia-Pacific, said the strong result would hasten Cray's rollout of new WAN and LAN products.

**Alcatel** and Pacific Bell have announced the cutover of the first Alcatel 1000 AX ATM multiplexer and router in the United States. Pacific Bell is using the equipment as part of its service trial of its 'Cinema of the Future' concept, which involves sending digitised movies and other programming to cinema complexes.

## AT&T, Ericsson Tie Up Guangdong

AT&T has become the latest global telecoms manufacturer to cash in on the exploding China market by signing what it describes as a five year \$US500 million 'partnership agreement' with the Guangdong Province Posts and Telecommunications Administrative Bureau (GPTB). In so doing it has encroached on territory so far successfully staked out by Ericsson.

Under the agreement, AT&T expects to receive more than \$US150 million in orders this year from the GPTB for its 5ESS-2000 switching systems, SDH equipment, digital cross-

connects and other equipment. It will also establish a technical support centre in Guangzhou to provide training for GPTB staff.

It's not yet clear how the new AT&T deal will impact on the GPTB's future relationship with old China hand, Ericsson. The Swedish giant has also recently announced a three year \$US400 million purchasing agreement with the GPTB for the supply of mobile, public switching and SDH equipment. Ericsson has had marked success in China in recent years, and now counts the People's Republic as its sixth largest market.

## Siemens Wins Iridium Deal

Siemens has won a \$44 million contract from Motorola to install mobile switching equipment for the planned Iridium satellite-based global telephone system. Siemens will supply its GSM-based D900 mobile system as a core element of the system which will link the Iridium constellation of 66 satellites to terrestrial networks.

The subject of considerable scepticism since it was announced in 1990, the Motorola-led Iridium project is scheduled to begin operations in 1998. Its backers say that it will cost \$4.4 billion and service one million subscribers within five years.

## IBM Lands Danish ATM Deal

The Municipality of Copenhagen has awarded IBM a contract to provide an ATM-based communications network. The network will be based on fibre optic cabling owned by the Copenhagen Energy authority and include 15 IBM Nways Broadband Network Switches. It will be used by Copenhagen Energy and other government bodies to provide an integrated voice and data service. It will also include a frame relay service.

IBM says a major factor in its success in gaining the contract was its ability to supply an integrated solution with extensive network management features.

## Ermes Progress at Last

Ermes, the much delayed pan-European paging service could be operational in France by the end of this year, according to Ermes Memorandum of Understanding Group Chairman, Roland Stadelmann.

Hitting back at criticism that Ermes has yet to deliver on its promises, Stadelmann maintained that it is "believed to be one of the largest collectively planned personal communications infrastructure enterprises ever undertaken." The service has been developed by the European pag-

ing industry for the "benefit of European and international paging markets — not for the gain of a single operator or paging manufacturer." He said that services in France would be offered by three different operators this year, with Sweden's Telia Mobitel scheduled to follow suit by the middle of 1995.

There are now 31 signatories — representing 19 countries — to the Ermes (European Radio Messaging System) MoU, and, according to the Group, more are to join shortly.



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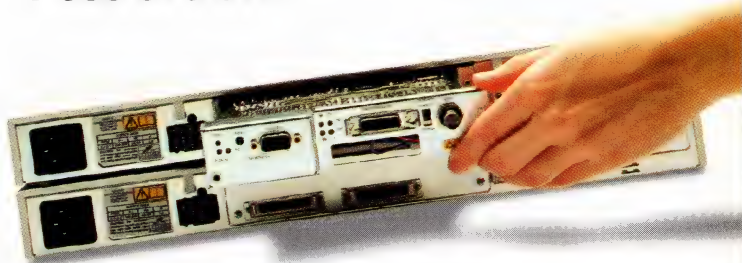


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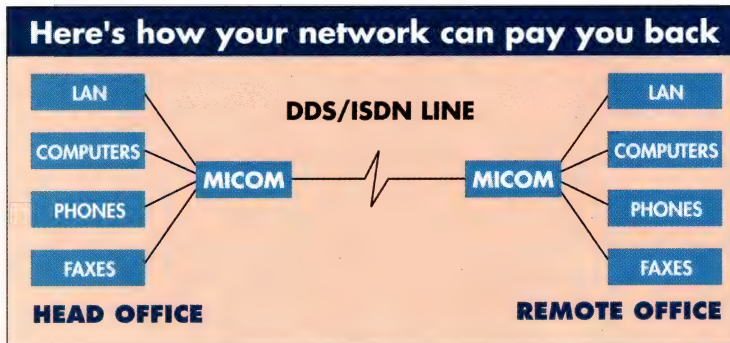
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# Catching the Next Wave

The neophyte cable TV industry is already lobbying to influence the next steps in telecommunications deregulation.

If he hasn't already developed them, Communications Minister Michael Lee will need nerves of steel as he seeks to establish an equitable framework for greater communications competition in Australia beyond 1996. Having initiated a series of examinations of the country's communications requirements after the current telecommunications duopoly ends, the Minister will inevitably be the target of intense commercial and political persuasion over the next nine months. By Budget time next year, he has the daunting task of putting together a politically and commercially palatable blueprint to maintain the momentum of the original move towards deregulation. The problem is that what started out as a manageable groundswell now looks more like a tidal wave of calls for open-slat competition and an early end to the duopoly regime.

The pressure has been intensified by the scramble to deliver Pay TV in Australia. A rash of proposals — exploiting every conceivable legal and technological loophole — has demonstrated how imaginatively and aggressively the various players are prepared to push the letter of the current legislation, rather than heed its spirit. The big issue here is whether cable companies should be allowed to deliver telephony services over their networks, as they are already doing in the United Kingdom, where cable operators have installed telephone lines to well over half a million subscribers.

Clearly, the local cable companies think they should. Queensland-based Rowcom Holdings, with 28 cable licences it bought for just \$1,600, states unequivocally that it is planning to deliver telephony, as well as cable services, over a \$500 million network passing 700,000 homes in the State's southeast in a joint venture with Cox Cable, the fourth largest operator in the US. The announcement by Rowcom chief, Dick Rowe, prompted Minister Lee to warn cable operators not to concentrate their efforts only in the most lucrative markets, and to avoid duplication of services to the same households. Rowe has since told *Australian Communications* that overseas experience proves there is always room for two cable operators in any given area on a 'one-plus-one' basis: 'one' being Telecom and the 'plus-one' being any other provider — not necessarily Optus.

Further north, in Townsville and Cairns, cable operator Paynet Telecommunications has reportedly claimed that it will sign its



first subscribers in a few months time. Paynet has reportedly been negotiating with Optus to act as its agent in order to gain cable laying access to residential areas. In exchange, Optus would receive capacity on the Paynet network to supply telephony.

Even Australis Media admits it would be only too willing to enter the telephony market using its multi-point distribution system (MDS) network, though the company concedes this will not be possible until development of new MDS digital compression technology is completed in the US.

According to the company's General Manager of Corporate Affairs, Jim Hoggett: "We are certainly not going to stop at subscription television. We want broadband services starting with Pay TV, graduating to home shopping, interactive services, pay-per-view, teletext — and telephony, if we can achieve it." Having paid around \$70 million for 209 of Australia's 224 MDS licences, Hoggett said Australis was competing aggressively with other local cable operators in negotiations with the big US movie houses, and would start broadcasting later this year.

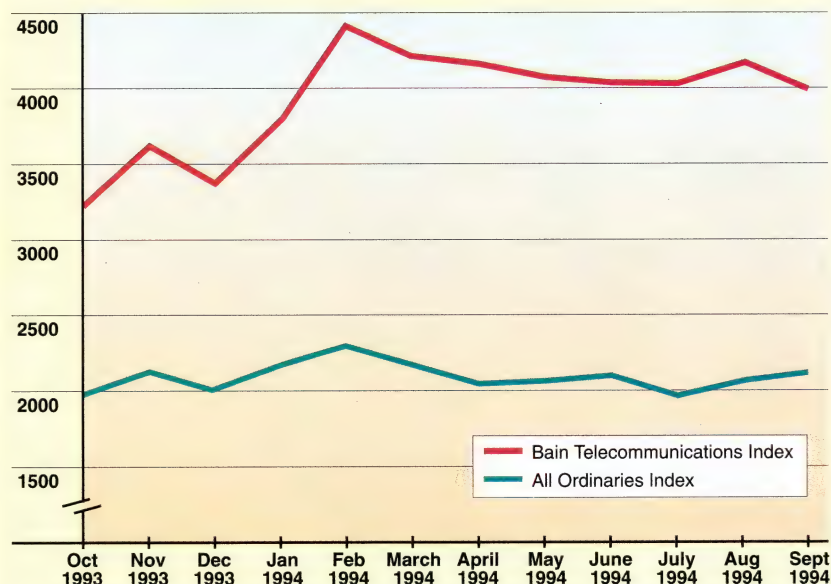
Optus's negotiations with electricity utilities to run coaxial cable via above-ground power poles further demonstrates the urgency and determination of the various players to enter the market as quickly and cheaply as possible. In a world where just about everyone is secretly negotiating with everyone else, managing the free-for-all through a regulatory framework looks an increasingly difficult task.

## Telecom's Edge

Because it stands to lose so heavily if cable companies are allowed to offer telephony, Telecom is pressuring the Government directly, and through some of its old stalwarts who are now MPs, to apply the brakes to any such move. For example, Optus's \$2.2 billion cable TV plans with Continental Cablevision, to pass two million homes within four years, are aimed at allowing the second carrier into the local call market. If Optus also does a deal with Rowcom-Cox at some point in the future — Optus has denied any involvement in the Rowcom-Cox plans — this would extend its reach along Australia's heavily populated east coast.



## Stock Watch



The Bain Telecommunications Index (BTI) includes only those public companies which derive the majority of their earnings from the telecommunications sector. It is calculated in the same fashion as the All Ordinaries Index and is maintained by the Australian Stock Exchange Index Office. The formula is:

$$\text{Today's Closing BTI} = \text{Yesterday's Closing BTI} \times \frac{\text{End of Day AMV}}{\text{Start of Day AMV}}$$

where AMV refers to Aggregate Market Value - i.e. total market capitalisation. The start of day AMV is the previous day's end of day AMV and is adjusted for any changes in the BTI such as additions, capital reconstructions, rights issues etc. This ensures that any movements in the BTI are the result of trading activity in that day only.

Company	Market Capitalisation \$M	Performance %	Share Price (\$)		
			1/9/94	52 Week High	52 Week Low
AWA	179	14.3	0.88	1.02	0.66
Datacraft	118	230.3	1.09	1.18	0.30
ERG Australia	405	49.8	3.05	3.70	1.82
Exicom	61	-52	0.60	1.40	0.50
JNA Telecommunications	68	-2.1	2.30	3.40	2.08
Matrix Telecommunications	107	69.2	2.20	3.65	1.30
NetComm	7	N/A	0.71	1.40	0.55
Scitec	35	175.0	0.44	0.51	0.13
Stanilite Pacific	201	66.6	6.83	7.21	4.00
Techniche	100	90.7	5.15	6.50	2.38

Market capitalisation is the share price multiplied by total ordinary shares on issue.

Performance is the percentage share price movement over the past 12 months.

Source:  
Bain & Company

According to Telecom's Group General Manager, Residential Video, David Pitt: "What we are seeking is early clarification. The real issue for us is how Optus will handle telephony if that arises out of any joint venture arrangements with Continental. Telecom now accepts that competition is here to stay, but we will continue to try to strike the best possible outcome for the corporation and the public."

Pitt added Telecom was poised to establish an edge over cable TV rivals by being the first to offer services from this month. He estimated that Telecom subsidiary, Visionstream, in partnership with Cable Television Services, would have 100,000 subscribers in Sydney, Melbourne, Brisbane and the Gold Coast by the end of the year. Other service providers would be signed over the next six months and Visionstream cable would pass

1.1 million homes by the end of 1996. With 64 channels available — and many more with video compression — Pitt said Telecom was also negotiating with the PMT consortium and Australis, as well as with middle-sized service providers wanting four to five channels, and smaller niche players such as groups wanting to establish 24-hour foreign language channels.

Pitt added Telecom had no intention of taking a financial stake in CTS, which plans a \$42 million public float. CTS is the first to sign up to Telecom's new cable service provider tariffs, based on a \$500,000 deposit or channel allocation fee, plus \$50,000 per channel and 50 cents per channel per home passed. For example, a service provider with 10 channels passing 100,000 homes would pay a total fee of \$1,500,000.

CTS has recently detailed its rollout plans by announcing it will this year service households in Paddington, Coogee, Lane Cove, Chatswood, Cremorne and Mosman in Sydney; South Yarra, Windsor, Malvern, Hawthorn, Balaclava and Toorak in Melbourne; and New Farm, Southport, Woolloongabba and Toowong in Queensland.

## Regulatory Problems

The possibility that cable operators may be able to offer telephony services has been welcomed by service provider, AAP Telecommunications. According to Director of Regulatory Affairs, Brian Perkins: "Within reason, some alternative access to local loop customers would offer new opportunities for us." Perkins said this view would form part of the company's submission to the Ministerial Review, as it had to the Austel review of service provider needs and the Broadband Services Expert Group.

According to Telecommunications and Broadcasting Manager at Price Waterhouse's Government Liaison Services, Chris Dalton, the whole issue of the convergence of telecommunications and broadcasting poses major regulatory problems. "Ownership and control issues need to be addressed as well as cable TV content. The *Broadcasting Services Act* is fairly rigorous on content, whereas telecommunications is self-regulating. The situation gets complex where you have services like video-on-demand which is officially regarded as a telecommunications service, but to all intents and purposes is a broadcasting service," he said.

Hambros Australia Director and telecoms consultant, Dr Chris Beare, said the growth of cable TV/telecommunications in Australia could potentially get out of hand. "Michael Lee wants a more open and more simple regime, but it would seem ridiculous if a whole bunch of people went in and triplicated services in high volume areas. The likely future scenario is that cable operators will be allowed to provide telephony. The last bastion of competition is the local loop and if the Government is pro-



competition, then theoretically it will want to see competition on the local loop."

The Executive Director of Continental Cablevision in Australia, Martin Hannes, said there was bound to be some rationalisation of the number of cable/telecommunications players in Australia after 1997. "But until we see what comes out of the Ministerial Review, no-one can take any clear position. You cannot necessarily assume that you can build a cable network then be allowed to provide telephony on it. We'll all have to wait and see."

## A Better Model?

According to Opposition Communications Spokesman, Senator Richard Alston, there should be no constraints on cable operators offering telephony. "Telecommunications

companies can offer cable services, so why shouldn't that arrangement be reciprocal?" he said. "The problem at the moment is that a lot of decisions about the future direction of cable and telecommunications are taking place within industry and outside the Government arena. The Minister should be making the tough decisions on the extent to which telcos and cable operators should be able to cross-compete. My feeling is that the Minister and the Government are frightened of doing anything that might backfire politically before the next election."

But according to Michael Lee adviser, Samantha Mostyn, the jostling for position is "indicative of the sort of environment the Government might have hoped for after 1997. The game is not ahead of us and the Minister doesn't see any need to regulate

cable at this stage. In fact, if you look at the UK and the US, where they moved quickly to regulate the industry, they're now trying to undo those laws and are looking to Australia to provide a better model."

All being well, that better model will emerge from the Ministerial Review, based on a mountain of responses to the recently released Issues Paper, which throws open discussion on everything from the optimal number of carriers in Australia, to the further deregulation of telecommunications tariffs, privacy, the evolution of personal communications services/networks and the future of telecommunications industry regulator, Austel. The only subjects that remain taboo are timed local calls and the privatisation of Telecom.

**Bernard Levy**

## Globalisation

# Telstra Defends Offshore Adventures

Speculation about the viability and seeming lack of profitability of Telstra foreign adventures has been intensified by the national carrier's decision to pull out of a joint venture in the Philippines potentially worth hundreds of millions of dollars. While Telstra continues to flourish at home with a record \$1.7 billion profit for 1993-94, recent news reports have upset the carrier by focusing on failed ventures and lost opportunities in Eastern Europe, the UK and Asia.

In the Philippines, Telstra decided to withdraw after failing to reach agreement with its local partners, the Lopez group, on the terms of the shareholder arrangements in a joint venture to provide an international gateway, a national transmission network and 300,000 local exchange lines. The news tends to counter Telstra's claims that it is on the way towards becoming the most successful carrier in the Asia-Pacific region, after shifting its export focus away from Europe and closer to home.

Despite its thick skin, Telstra was particularly stung by one headline in a national newspaper ('Telstra's Great Russian Retreat'), not least because the corporation counts a (successfully operating) satellite earth station on Sakhalin Island as its only Russian Venture. Its other operation in the old USSR is in Kazakhstan where a 10-year agreement to build and operate part of that country's international network has been running successfully for about three years.

However, the newspaper's assessment of Telstra's withdrawal from Poland, with an apparent net loss of \$6 million after selling off its majority stake in a local trunked radio operation, Uni-Net, could only be disputed in terms of the size of the loss.

But Telstra's real beef is that the story had overlooked some significant strategic decisions taken after the merger of OTC International and Telecom Australia International. According to Telstra's General Manager, Asia South and the Middle East, Peter Clifton, after OTCI and TAI merged, there was a deliberate shift away from Europe towards the Asia-Pacific, where Telstra was emerging as the most successful international carrier. "In the case of Uni-Net in Poland, it was a small business that required a lot of management and produced quite a bit of tension because of the political and economic climate of the time," he said.

"After the merger, it was decided that those energies would be better used in line with our Asia-Pacific focus. Why should we put our energies into countries the other side of the world with low growth rates, when there are enormous opportunities sitting right on our doorstep?

Clifton said he objected to the implication in the newspaper report — which also touched briefly on Telstra tender failures in Malaysia and the UK as well as hiccups in India and Hong Kong — that negative, or poor, outcomes had occurred. "It's as if there's some blame to be attached when you talk business with someone and it does not work out. It's no great disaster. All sorts of carriers have talks with each other all the time. If you ask the question: 'Which other carrier has been more successful than us in the Asia-Pacific?' you won't find one." He cited recent Telstra offshore business successes in Vietnam, Cambodia, Laos, Hong Kong, Thailand, the Pacific, Sri Lanka, Pakistan, Indonesia, India, Korea, China, Saudi Arabia, New Zealand, the UK and the US.

"Export revenue for Telstra was just \$200 million about two years ago; [Telstra CEO] Frank Blount has projected it will be \$1.5 billion within the next five years."

In India, Clifton said Telstra's bid for some of the eight GSM licences covering the country's four major cities — Delhi, Bom-

bay, Madras and Calcutta — had been delayed by court action involving the entire tender process, and not Telstra's bid specifically. "Broadly, a court ruled two years ago that one excluded bidder should be put back into the tender process and that some of the successful bidders be re-evaluated by the Communications Department in terms of their ranking, rather than whether or not they should be in the race. But this does not involve Telstra. The licences have still not been awarded, but we remain confident."

In the case of Malaysia, where Telstra was seeking to enter a \$500 million venture with Binariang Telecommunications, owned by high profile businessman, Tan Sri Ananda Krishnan, to establish a second carrier network last year, the Government had balked at the potential high level of foreign ownership. The issue had made headlines in the local *Star* newspaper, based on a report in an Australian newspaper, prompting the Malaysian Communications Minister to make a public statement.

In Hong Kong, Telstra had discussed a deal with Hutchison Telecommunications to build a fibre optic network for local calls. Hutchison was to control 80% of the project, with Telstra holding a 20% interest. Telstra decided not to go ahead because it could not reach an agreement on the levels of shareholding or the extent of its involvement in managing the business. Low fixed prices for local calls and low rental charges in Hong Kong had also been a factor in the decision not to proceed.

In the United Kingdom, Telstra lost out to BT rival Mercury in the tender to build a \$116 million private network for the British Civil Service, similar to the network now being built by BT for the NSW Government. "The British Government was under pressure to promote its own industry and greater domestic competition; it was a political decision on their part," claimed Telstra spokesman, Paul Rae.

**Bernard Levy**



## The DMF

## Finally: A Decision on the Decision Making Framework

After four public consultation sessions, a very lengthy, complex (an no doubt very expensive) report prepared by a bunch of very high powered economic consultants and a great deal of controversy, Austel has at last settled on the form of its Decision Making Framework (DMF): the means it will use to test if any tariff filed by a dominant telecommunications carrier is anti-competitive.

However the 'final' form of the DMF seems to have owed as much to pragmatism and empiricism as to input from industry and economic expertise. And Austel has made it clear that this process will continue, that there is no 'final' form of the DMF and that the framework will continue to evolve to meet the tasks it is required to perform.

In his introduction at the final DMF briefing session, held in Sydney on August 24, Austel Acting Chairman, Neil Tuckwell, listed sources of input to the DMF as: the consultants' report, industry views sought during public consultation and "Austel's experience in assessing tariffs since May." He said that, while Austel had been working on the DMF he was about to unveil, "the world has continued to turn (and) the draft DMF is already fully in use within Austel to assess filed tariffs."

The amendments to the *Telecommunications Act* which required the DMF to be developed were introduced retrospectively to take effect from March 15, 1994. They had forced the withdrawal of Telecom's Strategic Partnership tariff and something had to take its place. Without a definitive and public DMF Austel had to use a nascent version to meet the need and, in applying that version, learned much about its shortcomings and was able to amend it. "The DMF will not be a static document. It will evolve with experience and we will adjust it accordingly," Tuckwell said.

The first tariff ruling to be announced since the 'final' version of the DMF was Austel's decision to disallow Telecom's Reachout 75 tariff. This would have enabled customers to opt for a \$0.37 local call fee, instead of \$0.25, which would have given the untimed calls to any destination within a radius of 75kms. The tariff was trialled for six months from late last year and was widely seen as an attempt by Telecom to deter customers from using Optus for short distance STD calls.

In the end, this was exactly what Austel decided. Tuckwell said Austel had concluded that Reachout 75 "placed a con-

straint on the consumer's choice of preferred long distance carrier."

Chris Pattas, Austel's Manager, Pricing and Quality of Service, told the author that to arrive at this decision Austel had used an early version of its DMF and, in fact, that this process had contributed considerably to the final version of the DMF. This inevitably begs the question: if Austel is developing procedures on the fly what chance is there for public consultation? At the DMF briefing Tuckwell sought to reassure the industry that changes which Austel would make on its own initiative would be minor and that if major change was thought necessary "We will adopt a process of consultation."

That said, what do we have so far? The August 24 briefing was the first at which Austel had put its views on the DMF down on paper. At an earlier meeting it had presented successive versions of the consultants' report. Curiously this was written as an Austel document and, in spite of the disclaimer on the front page that 'any reference to Austel or Austel's views should be taken only as a recommendation to Austel by its consultants' the effect seems to have been to tar Austel with the same brush.

### Telecom Presumed Dominant

By far the most radical departure from its consultants' views was Austel's decision to abandon, or at least relegate to a subsidiary role, the recommendation that there be many markets and that any carrier be considered dominant where it command bottleneck power over access to that market.

Thus the consultants would have had it that, in the case of mobile telephony, there is not one market, nor even two (digital and analogue) but that each carrier's customers represent a separate market. Analogue customers can easily switch between using Telecom and Optus but there are three digital markets represented by Vodafone, Optus and Telecom. Under the consultants' recommendations each carrier has bottleneck power over access to those customers, is therefore dominant and is therefore required to subject its tariffs to Austel for scrutiny.

Austel took a much simpler approach. It decided that, for the purpose of the DMF, there should be five markets:

- Access and local calls together with some local exchange functions;
- Long distance (domestic) calls;
- Long distance (international) calls;
- Public mobile telecommunications services; and
- Sundry (i.e. all other services).

On the dominance question it has adopted the position that Telecom is guilty on all counts until proved innocent. 'Austel will treat Telecom as the carrier which is in a position to dominate (these) markets unless determined otherwise. Telecom would therefore be presumed dominant in all areas except the market for public mobile telecom-

munications services and pay TV, areas in which Austel has already made a determination.' Tuckwell justified this radical shift in the Austel approach by saying that it represented a necessary compromise between the extremes of the views presented to Austel.

He said the views of the various industry participants "could not be reconciled." At one extreme some had argued that (putting mobiles aside) there was only one market, the public switched telephone network, and at the other extreme there was the view that there were multiple markets with each product representing a separate market.

"While we would prefer consensus we don't see that as mandatory and we believe that consensus on market definition is probably unachievable," Tuckwell said.

Having ruled Telecom dominant, Austel will of course face challenges from Telecom from time-to-time that it is no longer dominant in certain markets. Austel says it is prepared to review its a priori assumption of Telecom dominance but 'would require some prima facie evidence which suggested that there was a reasonable case before initiating such a review.' If such a review were to take place, Austel says it would then invoke the approach to defining and determining dominance recommended by the consultants. That is, it would use the 'building block' or basic network services approach put forward in the consultants' report as a means of identifying bottleneck control and as an important component of dominance analysis.

### Assessing Anti-Competitiveness

Determining dominance was only part of the problem set to the consultants. The other part was how to assess a dominant carrier's tariff for anti-competitive effects. Here too Austel has deviated significantly from the consultants' recommendations.

Qualitative assessment of anti-competitiveness is relatively straightforward. Austel will apply two tests: tying and bundling and foreclosure of services. Austel says it will generally consider any tariff as anti-competitive where the supply of a service is made conditional upon the supply of another service and will 'give close scrutiny to' arrangements which bundle together services facing different intensities of competition. Pricing packages linking the supply of mobile telephone services to non-mobile services will also, in general be considered anti-competitive.

In general, Austel says that all bundles should be able to be broken up into their constituent prices so that consumers are free to buy each service separately at the same price as that charged for it in the bundle. Where supply of service by a dominant carrier carries exit penalties in excess of limits defined by Austel, such a practice

*Continued on page 25*



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# TELENEWS Asia

## United States

### Baby Bells Fight for Long-Distance Stake

Four Regional Bell Operating Companies (RBOCs) have filed a motion asking for relief from over a decade of strict regulatory restrictions that prohibits them from offering long-distance services.

In a 1,500 page motion to US District Judge Harold Greene, Bell Atlantic, Bell South, Nynex and Southwestern Bell have asked that restrictions preventing them from carrying long-distance calls and from manufacturing equipment be lifted. The restrictions stem from a 1982 agreement signed by AT&T and the US Federal Government that broke up the Bell System in 1984, called the Modification of Final Judgment (MFJ).

The motion is a result of two recent US Supreme Court decisions that state, 'judicially enforced settlement agreements should be terminated when the purposes of the original lawsuit have been fulfilled, or when changed conditions make continued enforcement of the settlement contrary to the public interest.'

Backers claim its chances of success have been heightened by Judge Greene's recent decision to allow AT&T's acquisition of McCaw Cellular to proceed. This gives AT&T a clear advantage because it can now combine long-distance and cellular services, they say.

With several very different bills being tossed about in Congress, and no guarantees, the RBOCs are remaining hopeful that the restrictions will be lifted with their aggressive strategy, and they will be allowed to provide long-distance services as soon as possible. The RBOCs are hoping they will not be subjected to an 'actual and demonstrable competition' test, which would delay their entry into long-distance.

BellSouth spokesperson, John Schneidawind, says filing suit was simply one avenue of approach. With two possible ways of getting out of restriction, courts and Congress, the RBOCs decided to take both. After all, Schneidawind said, there are no assurances legislation will be passed. "For us to have not filed a lawsuit means sacrificing our chances," he explained. "You can only try as many paths as you can. The longer we wait, the more money it costs consumers and companies."

According to Southwestern Bell spokesperson, Bob Ferguson, all the RBOCs really can do is wait. The filing could take months — it is slowly working its way up the court calendar. The Senate Commerce Committee approved the *Communications Act* of 1994 on August 12, but it still needs several other committees approval as well. The bill would not require the RBOCs to prove 'actual and

demonstrable competition,' but it would require that they satisfy some other preconditions before entering the long-distance market.

While Ferguson said that removing the need to prove competition is positive for the RBOCs, it is by far not a perfect solution. "There are a host of issues that deal with over-regulation [in the bill]," Ferguson said. "Dozens and dozens of pages of regulations need to be removed."

If the *Communications Act* does not pass, or if certain amendments are made, the RBOCs may have to prove that there is competition in the local telephone service market. The RBOCs insist there is room for competition and that several companies are slowly providing service. Competitive access providers are currently providing service for large corporations in New York, for example. In addition, recent provisions are allowing cable companies to provide local service. Also, long-distance service provider MCI has invested \$US20 million in developing a local telephone service program. Schneidawind says that if enough competition does not exist, it is not the RBOCs' fault.

He claims that where the RBOCs have a local monopoly it exists because no one else wants in. "It costs too much money to string telephone wire. They [other providers] only want to go for the big telecommunications users," he claims. However, some observers suggest that there are companies wanting in to the local market, but can't because of local and State laws and because the RBOCs' intimidating strength makes it difficult to raise enough money and resources to get a sure footing.

AT&T spokesperson, Wayne Jackson, says the RBOCs' claims that the local market is now competitive are "disingenuous at best." Until the local telephone market is completely opened up, the RBOCs have no business trying to provide long-distance service, he says. Any competition that now exists in the local market is between the cream-skimmers, or competitive access providers, he said, and not in the area of residential service. If the RBOCs are allowed in, they will have the opportunity to shift business very easily.

Jackson says that the kind of competition presently in the long-distance market is good — that in excess of 500 long-distance providers have driven down prices for consumers. The RBOCs, on the other hand, say that the three largest long-distance providers, AT&T, MCI and Sprint, constitute an oligopoly and that they are overcharging consumers by as much as 50%.

Harvard economist, Robert J. Barro, one of 47 prominent independent economists supporting the RBOCs, wrote in a statement to Judge Greene that the long-distance market 'appears today to operate with AT&T as the price leader, with MCI and



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Sprint following AT&T and not attempting aggressively to expand market shares by cutting prices.' By lifting the 1982 ban, 'the oligopolistic behavior' would be alleviated.

The RBOCs are also arguing that foreign providers are now making their way into the US markets, as seen by a series of alliances between MCI and British Telecom, Sprint and the national telephone companies of Germany and France, and Bell Canada. The RBOCs are predicting foreign carriers will consolidate their stakes in the US market. As such, the American economy will suffer losses, and competitiveness will be eroded they claim.

In addition to providing more US competition the RBOCs claim that it will make

much-needed strides in the area of telecommunication equipment innovation, and lower prices for consumers if the MFJ is overruled. Franklin Fisher, Professor of Economics at Massachusetts Institute of Technology, said that preventing the RBOCs from using their expertise in manufacturing also makes the design and development of new equipment "slower and more costly than necessary."

Dataquest analyst, Adam Reeves says that ultimately, the suit will probably not have an impact when it comes to shifts in regulation. Changes that will be made, will be made in Congress. The RBOCs will eventually gain access to the long-distance markets, he said, but probably not before

Congress closes session for the year — despite a seemingly strong acceptance of the *Communications Act*.

Reeves cites three reasons: opposition from several local exchange carriers, the need for a compromise between the House and Senate versions of the Bill, and the Health Care Reform Bill taking up Congressional interest.

"The bill will most likely get caught up in the judicial committees," Reeves said. In any case, it is unlikely that the interexchange carriers, the RBOCs and the cable companies will all be able to walk away happy, although increased competition is likely to occur no matter what, he said.

**Erin English**

## Australian Industry

### ERG Goes From Strength-to-Strength

Flush with bolstered revenues and swollen order books, indigenous Australian electronics and telecommunications manufacturer, ERG Australia, is being hailed in Canberra and elsewhere as a glowing example of the success of the Government's industry support and development policies.

Small wonder. Few Australian companies have managed to achieve the sort of growth rates experienced by the Perth-based company, which recently announced its 1993-94 profits had leapt 123% to \$13.6 million, from \$6.1 million the previous year. The performance was based on record operating revenues of \$98.3 million, up 39% on 1992-93. Even more spectacular, the company expects similar growth rates for financial 1994-95, much of this coming from exports.

Consisting of two divisions, Automated Fare Collection (AFC) and Telecommunications, ERG's results this year were based on strong sales of its AFC systems in Australia and overseas (about 60% of revenues), as well as manufacturing paging base stations for Asian and local markets, and GSM base stations, manufactured under licence for the Finnish multinational, Nokia Telecommunications, and sold to second carrier, Optus Communications, BellSouth in New Zealand and other carriers in Asia.

Apart from the strategic alliance with Nokia, ERG's other major telecommunications customers include Goldstar, Philips Telecommunications and Matrix Communications. ERG has supplied paging base stations for Matrix's extensive Asian and local operations for the past two years.

ERG Finance Director, Peter Harley, told *Australian Communications* that next year's healthy sales projections were based largely on exporting both telecommunications products and the AFC systems worldwide. The company's paging transmitter would also be heavily marketed in Europe, where its main

rival was Ericsson and to a lesser extent, US giant, Motorola. Export success was also expected with a new 'tropicalised' GSM base station, developed jointly with Nokia, which incorporates its own air-conditioned unit and therefore does not need the usual hut for protection.

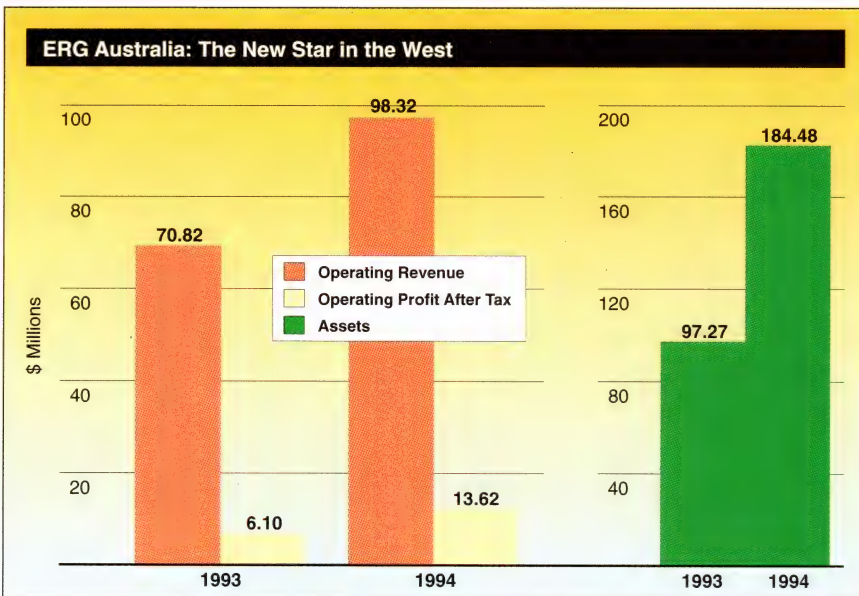
"With AFC, we have won contracts in most of the big Australian cities, so our focus will now be more on exports," he said. "ERG has benefited significantly from government support schemes such as the Computer Bounty and local content requirements under the industry development schemes. We have now achieved a 70% local content level in the GSM base stations and all our products are now price competitive enough to hold their own overseas."

### Internationally Oriented

Harley said that apart from establishing a new Card Systems section to make the most of new opportunities in Stored Value Cards systems worldwide, ERG was planning to double the size of its factory and office complex at Balcatta in Perth, at a cost of \$7-8 million. Much of the manufacturing for the Melbourne AFC contract will be carried out in the southern capital. Equipment for the Hong Kong transport operators will be manufactured in Australia.

Director of Telecommunications and Broadcasting at the Department of Industry, Science and Technology, Raph Cicchini, said ERG was a prime example of the kind of success the Government had always hoped to foster under programs such as the carrier industry plan, the Partnerships for Development and the Fixed Term Arrangements. Cicchini cited other examples such as the relationship between Nortel and Exicom; the former NCR (now AT&T) and Datacraft and Stallion Technologies; Apple Computer and LSE Manufacturing; and Amdahl and the Magellan Group.

Managing Director of Nokia Telecommunications Australasia, Pertti Melamies, said much of ERG's success could be attributed to the strategic planning of Chief







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Executive, Peter Fogarty, who joined ERG in the mid-1980s. Melamies said ERG had become highly competitive in its manufacturing processes and this had contributed to his own company's solid performance.

"We had local content obligations as well as manufacturing and export conditions in our Partnership for Development arrangements. Because we had already done business with ERG before with their own trunked mobile radio gear, we knew the company was easy to work with. Their company structure and management is not typically Australian; they are a more internationally oriented company. They meet our quality standards, which are very high; in return we offer technology transfer and contribute towards their manufacturing management skills."

While the ERG Board has recently decided against paying a dividend for the 1993-94 year in favour of reinvesting in research and development and further company expansion, ERG shareholders, including some 300 of the company's 550 employees, can be satisfied that the value of their shares has risen from a modest 15 cents in 1990 to a healthy \$3.10, capitalising the company at \$430 million from the original flotation valuation of \$15 million.

**Bernard Levy**

*DMF from page 18*

will, in general, be viewed as having an anti-competitive effect.

Quantitative assessment of anti-competitive effects proved much more difficult. Tuckwell said that Austel preferred the consultants' approach of flag prices, that is, the price carriers will charge other parts of their own business, for basic network services (the building blocks from which end-to-end network services are composed) but acknowledged that such an approach could be implemented only after a lengthy transition period. Austel also acknowledged 'some concerns still exist within industry as to the complexity of the implementation of the flag price approach and on the acceptability of this approach.'

Until such issues are resolved, Austel has adopted a two-tier approach to assessing the quantitative anti-competitive affects of any filed tariff: a test for predatory pricing and for competitive parity. The competitive parity test will be applied by comparing the retail price for a service with the relevant carrier interconnect rates and deciding if it has the effect of preventing or deterring market entry. Predatory pricing will be assessed by comparing the retail cost of a service to the cost of providing it as measured in terms of

total service long run incremental cost (TSLRIC), a retail cost below TSLRIC will be deemed anti-competitive.

Because TSLRIC cannot readily be determined from the information presently available in Telecom's chart of accounts and cost allocation manual, initial comparison with the fully distributed cost (FDC) will be permitted. FDC is higher than TSLRIC so any tariff which is higher than the FDC cost would not be anti-competitive. If it failed the FDC test, then Telecom would be required to submit TSLRIC details.

The next major test facing the DMF may be Telecom's long awaited service provider tariff. Service provider sources claim to have seen many drafts as Telecom has tried to develop an acceptable wholesale tariff without Austel being willing to declare a separate class of persons. Telecom has held discussions on the subject with Austel, but has not filed a tariff. Austel is now saying that the service provider enquiry, now under way, is the preferred avenue to resolve this issue, and not the DMF.

However given the intensity of competition the first test for the newly revealed DMF will not be long in coming.

*Stuart Corner is the Publisher of Exchange and Telenews Asia.*



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# HSM Tames the LAN Storage Tiger

Net managers need a long-term solution to the LAN storage crunch. Hierarchical Storage Management may be the answer.

**M**ore users, killer applications, and mammoth files — corporate LANs are on the verge of a chronic and potentially budget-crippling data storage crisis. The quick fix — bulking up servers with more and bigger hard drives — can cause more administrative problems than it solves. And no matter how many gigabytes of drive space net managers load into their servers, another shortage is almost sure to be on the horizon.

HSM (Hierarchical Storage Management) is being heralded as a way around trying to fill the bottomless LAN storage pit with conventional hard disks. Makers of HSM products say their offerings not only provide ready access to vast amounts of storage space but also cut the cost of keeping and maintaining expanding volumes of corporate LAN data.

HSM products attack the LAN storage problem on two fronts. First, they use high-density media like optical disks and magnetic tapes to store all the little-used files that now clutter server hard drives. Although optical-disk jukeboxes and autoload tape drives are expensive, their ability to hold dozens of high-density platters or cartridges translates to lower costs per megabyte compared with conventional hard disks. Second, HSM systems automate all file management tasks, virtually eliminating the high maintenance costs now looming for large corporate LANs. The fact that stored files can be retrieved automatically gives HSM a big advantage over conventional archiving, which typically requires locating the tape or disk on which a needed file is stored, manually loading that tape or disk into a drive, and then downloading the file for sending to the appropriate user.

Assuming that HSM vendors even come close to their ambitious projections of data storage at a cost of \$0.10-0.40/megabyte, HSM could one day emerge as one of the LAN industry's biggest bargains. That day hasn't come just yet, however. Before HSM becomes a LAN storage saviour, a laundry list of issues and problems must be sorted through and addressed.

Although HSM technology has been deployed in the IBM mainframe world since the mid-1970s and is a mainstay in Unix environments, it is just now finding its way into LANs. Early users of the handful of LAN-based HSM offerings now on the market have encountered a wide assortment of nagging and frustrating problems, in-

cluding difficult and time-consuming installations, errors that render some stored files useless, and compatibility problems with LAN operating systems and backup software. Problems with backup software are especially troubling, since many HSM products don't come with backup facilities.

## No Choice

Given the growth rates projected for corporate LANs, big companies eventually may have no choice but to migrate to some type of less expensive but less responsive approach to storage management, such as HSM. "The volume of data held on corporate LANs is growing at a rate of 50% a year," according to Glen McDermid, program director of large computer strategies service at US market researcher, The Gartner Group.

Some of the increase is due to the number of users being added to corporate networks. The rest stems from the arrival of a new generation of software — such as vid-

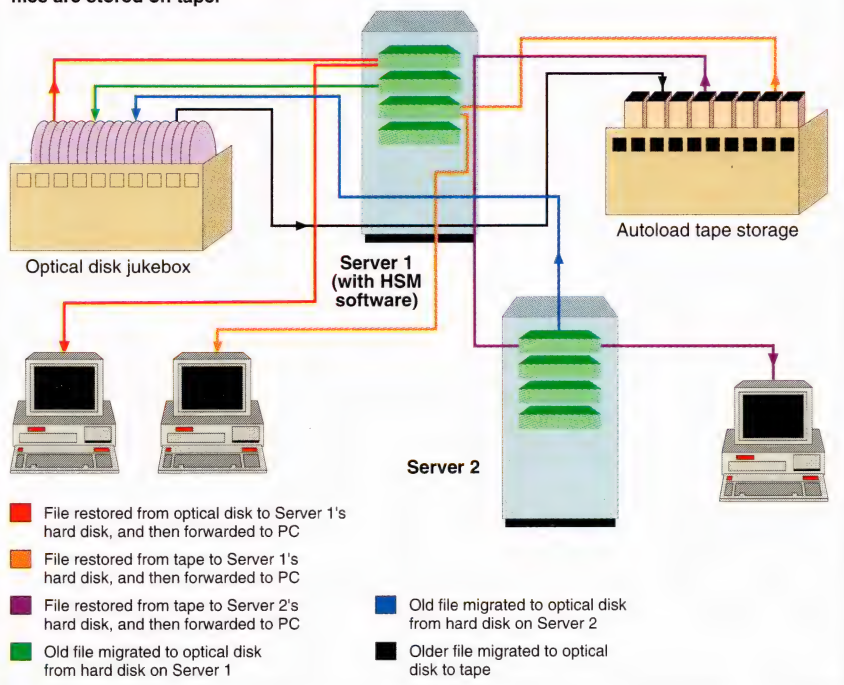
eo, graphics, and multimedia applications — generating files that contain hundreds of megabytes (or even gigabytes) of data.

In the short term LAN administrators might be able to deal with such heady growth rates by adding more hard drives — which is pretty much the way most companies are handling the problem now. In the context of long-range planning, however, that approach doesn't hold up well. A 50% annual growth rate means that after five years, a LAN's storage capacity will have to grow by more than seven and a half times. For large corporate LANs, potential storage needs are staggering.

HSM is intended to ease the burden of handling and managing all this data. Prospective buyers have a growing number of products to choose from: currently in the US eight companies are either shipping LAN-based HSM products now or plan to do so by year's end. The list of suppliers includes LAN storage specialists as well as network giants IBM and Novell.

## Charting HSM File Migrations

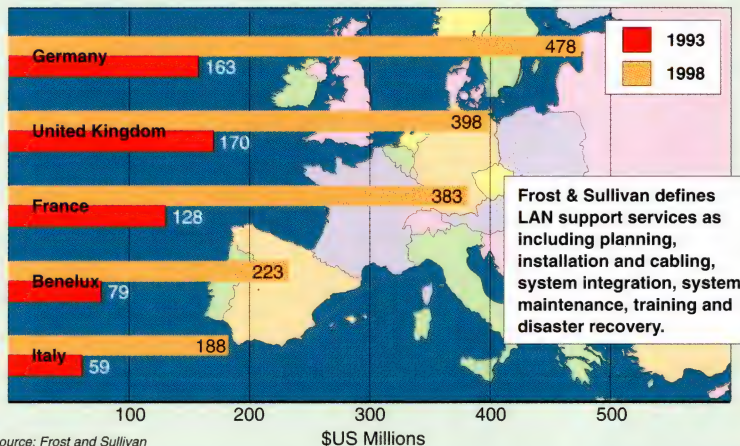
With Hierarchical storage management software, a LAN server can act as a storage clearing house, moving older files to high capacity optical disk and tape storage systems to free up space on server drives. If a LAN user requests a file stored on optical disk or tape, the HSM-equipped server retrieves that file and forwards it to the user. Such operations can take anywhere from several seconds when optical disks are involved to several minutes when files are stored on tape.



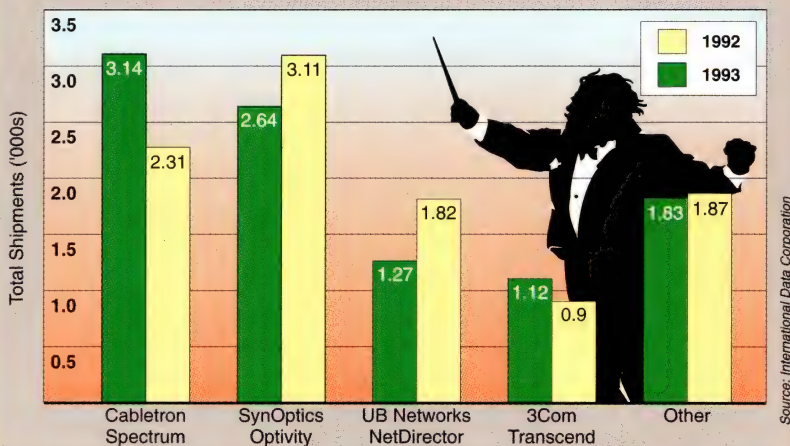


## Market Watch

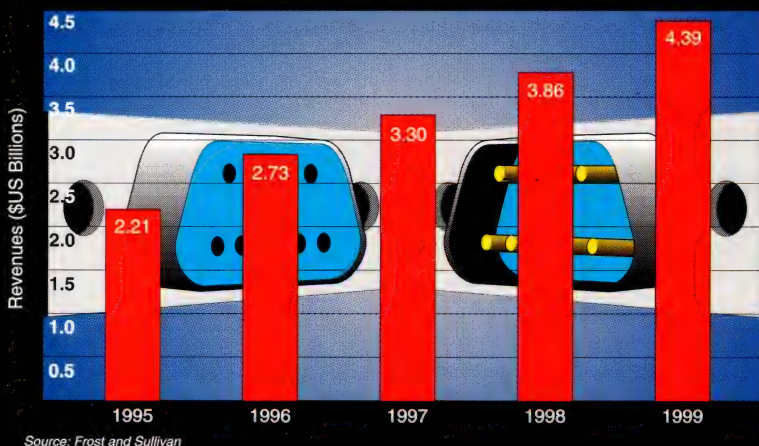
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## How it Works

As its name suggests, Hierarchical Storage Management replaces conventional single-tiered LAN storage which relies solely on server hard disks, with a hierarchy made up of different types of storage media. Under a typical HSM setup, new files and files that are accessed on a regular basis are stored on server hard drives, for quick access by end-users — just as they are today. But files that haven't been accessed for a given period of time — as specified by the LAN administrator — are moved off hard disks and onto cheaper storage media, such as an optical-disk array.

Whenever it moves a file, the HSM software leaves a stub file, a sort of marker that contains information about the moved file. Stub files serve two purposes: they hold the place for moved files, giving LAN users the impression that the file still resides on the server's hard drive, and they include pointers that direct the HSM software to the file's new location. When a user requests a migrated file, the HSM software reads the stub file to find the requested file's location, retrieves the needed file, and then restores it to the hard drive. The server then sends the file along to the user requesting it.

Although some HSM products accommodate only two hierarchical storage levels, several offerings allow for the creation of three or more levels. Products that allow more than two tiers enable users to deploy a combination of optical-disk storage and less expensive tape storage. For instance, if a file stored to optical disk remains inactive for a predetermined period of time, that file can be migrated to storage on magnetic tape.

The whole file management and retrieval procedure is supposed to be transparent to the user. And once the administrator takes the time to set up the parameters governing file migration, the system runs on its own. Of course, the main attraction of LAN-based HSM is its ability to cut storage costs. Just considering hardware costs alone, optical disk and tape offer tremendous savings over hard disks.

## Vision and Reality

Although hierarchical storage technology has been around since 1974, when IBM launched its first mainframe-based HSM product, LAN-based products are just coming to market, which means the inevitable kinks have yet to be worked out. Among the most common problems found with early LAN-based HSM offerings are compatibility hitches with NetWare — by far the most common operating system used by HSM vendors — and operational problems with conventional LAN backup applications. And while vendors are touting their LAN HSM products as easy to use, back in the real world users are finding that configuring HSM on a distributed LAN made up



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## Storage Management Options

APPLICATION	BACKUP	ARCHIVING	HIERARCHICAL STORAGE MANAGEMENT
<b>Function</b>	Automatically makes copies of all files stored on a LAN server	Automatically moves old or unused files from a LAN server to a storage device, typically an off-line tape drive	Automatically migrates old or unused files from a LAN server to a high-capacity storage device and then retrieves those files as users need them
<b>Storage hardware</b>	Tape drive or optical disk	Tape driver or optical disk	Optical jukebox or autoload tape drive
<b>Advantages</b>	Prevents files from being lost in the event of a system failure on the LAN server; easy to configure; relatively inexpensive	Frees up storage capacity on file server; reduces time spent on disk management; easy to configure; relatively inexpensive	Frees up storage capacity on file server; substantially reduces time spent on disk management; gives users access to older files without requiring the intervention of LAN administrators
<b>Disadvantages</b>	Does not increase server storage capacity	Because archived files cannot be recovered automatically by LAN users, LAN administrators must retrieve all requested files	LAN-based products are new, and compatibility problems with network operating systems and backup applications may occur; configuration can be tricky; expensive compared with archiving products

of multiple dispersed servers and storage devices isn't such a snap.

Teething problems, along with the high initial cost of installing HSM hardware and software, may relegate LAN-based HSM to the realm of leading-edge niche technology for the next couple of years. Rather than rush ahead with HSM, many companies may opt to extend their LAN storage capacity by using the more tried-and-true archiving approach. Although archiving has some glaring limitations when compared with HSM products — the biggest being the inability to retrieve files automatically without the intervention of a LAN administrator or technician — it is comparatively inexpensive and easy to deploy.

Companies that can't afford to wait two, three or more years for Hierarchical Storage Management products to age gracefully will have to sort very carefully through today's offerings to find the right combination of features and services. Although HSM products from different vendors are based on the same general concepts, approaches to implementing those concepts can vary widely.

One of the biggest differentiators is in the number of hierarchical levels a given HSM product can accommodate. Other key differences include product configuration, methods used to interact with network operating systems, level of support for third-party optical and tape storage drives, the ability to accommodate backup applications, and the kind of management interface provided.

Among the products now available, Inspire Migrator from Alphatronix, High Capacity Storage System (HCSS) from Novell, and Palindrome HSM from Palindrome Corporation handle only two hierarchical tiers. This means they can migrate files only once, from the first tier (the hard disk in the

server) to the second (either an optical disk or a magnetic tape device).

In contrast, products like Netspace from Avail Systems, Cheyenne HSM from Cheyenne Software, and ADSM/2 from IBM accommodate three storage tiers, allowing net managers to tune their storage system by migrating files twice. A typical three-tier setup could include conventional disk storage at the first tier, optical storage at tier two, and lower cost (and much slower) magnetic tape storage at tier three.

A couple of products handle even more levels. Novell says its Mass Storage Services (MSS) product, co-developed with Imagery Software, allows net managers to set up as many as 15 tiers in an optical storage hierarchy (Novell's products don't work with magnetic tape drives). Advanced Software Concepts says there's no limit to the number of tiers that its Netarchive product can handle.

The idea is that net managers will use the extra tiers to organize their HSM systems. For example, a file migrated off a departmental file server could first be moved to a high-performance optical-disk jukebox adjacent to the file server, then onto an older, slower model also in the department, and ultimately onto an optical device located in a secure room in another part of the building. Some HSM vendors, however, contend that supporting more than a handful of tiers is overkill.

Multi-tier HSM systems also exact a performance price in terms of file retrieval times — a potentially sticky problem, especially if end-users are accustomed to sub-second responses from file servers. The more levels in a storage hierarchy, the longer it takes to retrieve a file. And if one of those levels involves magnetic tape storage, the delay can be crippling.

## Enterprising Storage

LAN-based HSM products are based on one of two configuration approaches. Alphatronix's Inspire Migrator and IBM's ADSM/2 take the single-server approach, in which one file server loaded with HSM software migrates files to and from one or more storage devices directly attached via a high-speed interface, such as a SCSI connection.

Under the second approach, HSM software is used to convert a network server attached to storage hardware to the status of storage server. This server then acts as a storage clearing house for other servers distributed throughout the LAN, with files migrated to and from those servers over the LAN connection. Typically, as many as eight distributed servers can be attached to a single HSM-equipped storage server.

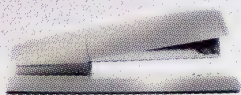
The main benefit of the storage server approach is lower cost, since only one server has to be equipped with HSM software.

However, the main trade-off with the storage server scheme is lower performance: distributed servers must use the LAN connection to request files from the HSM-equipped server. For end-users, this means an even longer wait for migrated files. Note that Avail's HSM software runs on a dedicated server. That means the server can't be used to run other applications, such as file and print services. In contrast, the other NetWare products run as NetWare Loadable Modules (NLMs) on non-dedicated, general-purpose servers. IBM's ADSM/2 product also runs on a non-dedicated server.

## NetWare Ties

Although features like the number of tiers supported and server configuration make for obvious distinctions among LAN-based HSM products, maybe the biggest contro-





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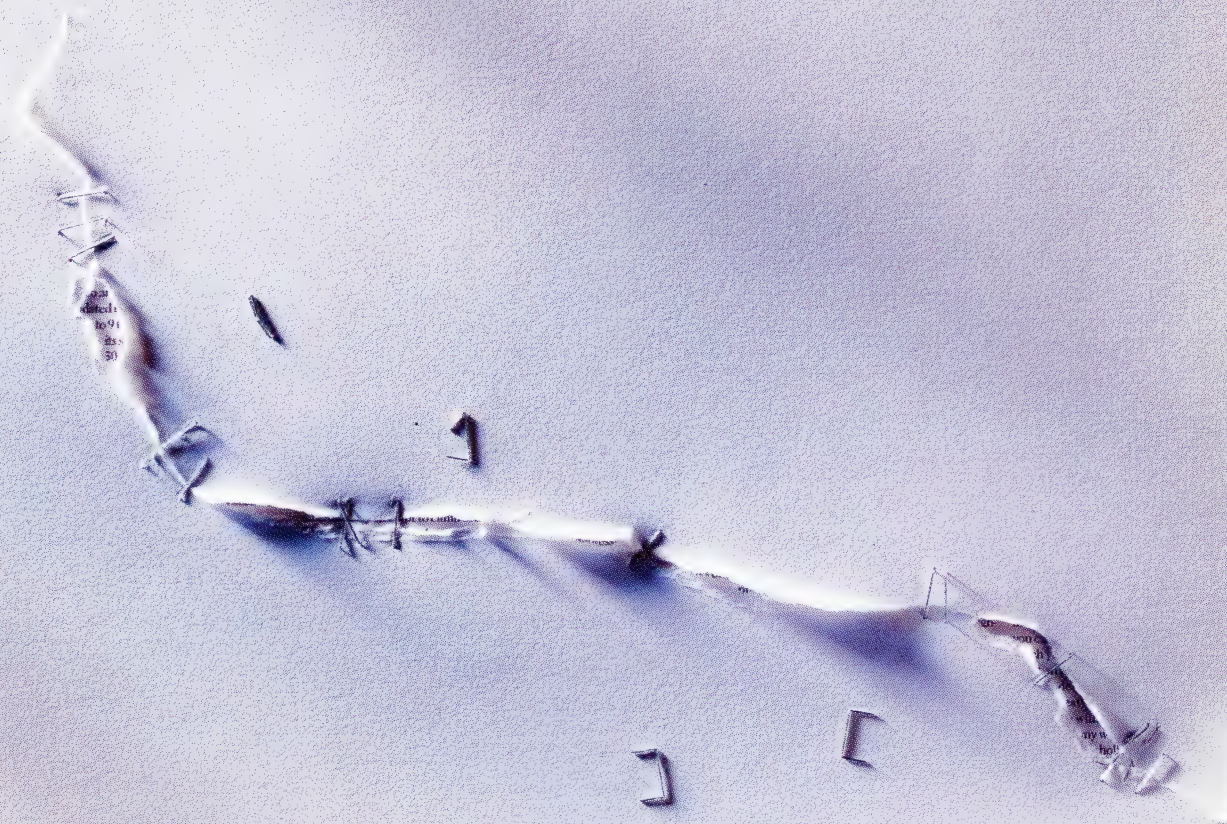
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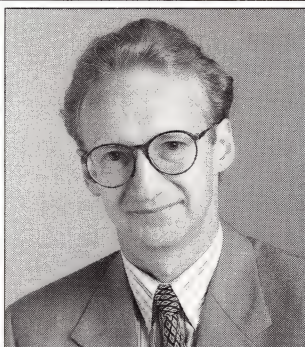
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# What's holding your network together?







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# Exchange

versy among HSM vendors involves how their software communicates with the network operating system.

Except for IBM's offering, every HSM product now available is built to work with Novell's NetWare. Products from Avail, Cheyenne, and Palindrome work with NetWare 3.x or 4.x. Offerings from Advanced Software Concepts and Alphatronix work with 4.x only. Novell has two HSM products — one for NetWare 3.x, the other for NetWare 4.x.

In general, products tailored to 4.x use a set of Novell-supplied application program interfaces (APIs) called Real Time Data Migrator (RTDM) to send commands to the NetWare file system. "The idea behind RTDM is that software developers can use it to screen their applications from changes to the NetWare 4.x file system," says Scott Wells, Product Line Manager for NetWare Core services at Novell in the US. Third-party HSM applications that are written to RTDM should be able to run unmodified when new versions of the operating system appear, or after Novell has issued software patches for existing versions.

Unfortunately, RTDM is not available for NetWare 3.x, which means vendors with 3.x-compliant products have had to find workarounds to send file commands to the operating system. Cheyenne has tackled the problem by making proprietary modifications to the NetWare file system. Palindrome uses a Novell API to interrupt file requests from PC users and hold them open until the migrated file can be restored (it uses the same method with its NetWare 4.x product as well).

Critics claim that both these approaches incur the risk that changes made by Novell to the 3.x file system could disrupt the HSM applications. "If you're using proprietary hooks into the operating system and Novell issues a patch, then the two of you can end up on separate paths," said Edward Cooper, Vice President of Marketing at Legato Systems, a vendor of LAN backup and archiving products and that plans to develop and HSM offering of its own. Neither Cheyenne nor Palindrome was able to explain how their approaches could avoid compatibility problems caused by operating system changes.

Avail admits that compatibility problems with NetWare afflicted the first version of its HSM product. Avail addressed the problem by using NetWare Core Protocol (NCP) commands to communicate with the NetWare 3.x and 4.x file systems. Using Novell's NCP orders solves any compatibility problems, and Avail has shied away from deploying RTDM-based products to issue new versions of their software.

Novell insists, however, that any enhancements it makes to RTDM will not affect existing third-party HSM products. For the record, IBM says that there are no compatibility problems between ADSM/2 and

its LAN Server operating system because it uses its own API's to meld the two together.

One factor differentiating HSM products isn't subject to dispute: the more drivers and HSM package offers for third-party storage devices, the more likely that product will work with optical and tape drivers now in place.

## Backup Concerns

A very common misconception about HSM products is that they all can handle backup chores. That's usually not the case, since HSM products are optimised for moving files, not copying them. (An exception here is Avail's Netspace, which comes with a backup feature as part of the standard product.) Several HSM vendors — including Advanced Software Concepts and Cheyenne — do sell separate backup products, however. Generally, these products can be managed from the same console as HSM applications, and they can share the same storage capacity. Palindrome's HSM product actually is an add-on to the vendor's Network Archivist backup and archiving application. Palindrome says it will offer a standalone HSM product by year's end. Meanwhile, IBM and Novell recommend that users of their HSM products deploy the backup facilities provided as an integral feature of the LAN Server and NetWare operating systems, respectively.

Vendors that sell both HSM and backup applications say that buying both from the same source avoids the possibility of compatibility problems, but there are also other ways to avoid compatibility headaches. Avail and Palindrome say they allow users to set up filters that can recognise requests for file restoral made by third-party backup applications and ignore them.

Novell's RTDM APIs are intended for use by developers of all kinds of storage management applications; the vendor asserts that RTDM-compliant backup and HSM products from different vendors should work together without a hitch.

## Migration Patterns

With all HSM products now available, net managers determine which files are to be moved to optical disk or tape storage by setting 'high watermark' and 'policy management' parameters from the HSM management console.

The 'high watermark' parameter establishes that the HSM application will begin migrating files only after a predetermined amount of capacity has been used up on the server disk (80%, for example). On the policy management side, all Hierarchical Storage Management products let net managers select files for migration on the basis of their age, or by determining when they were last opened. Most also allow files to be selected on the basis of their size — a useful feature because HSM provides better per-





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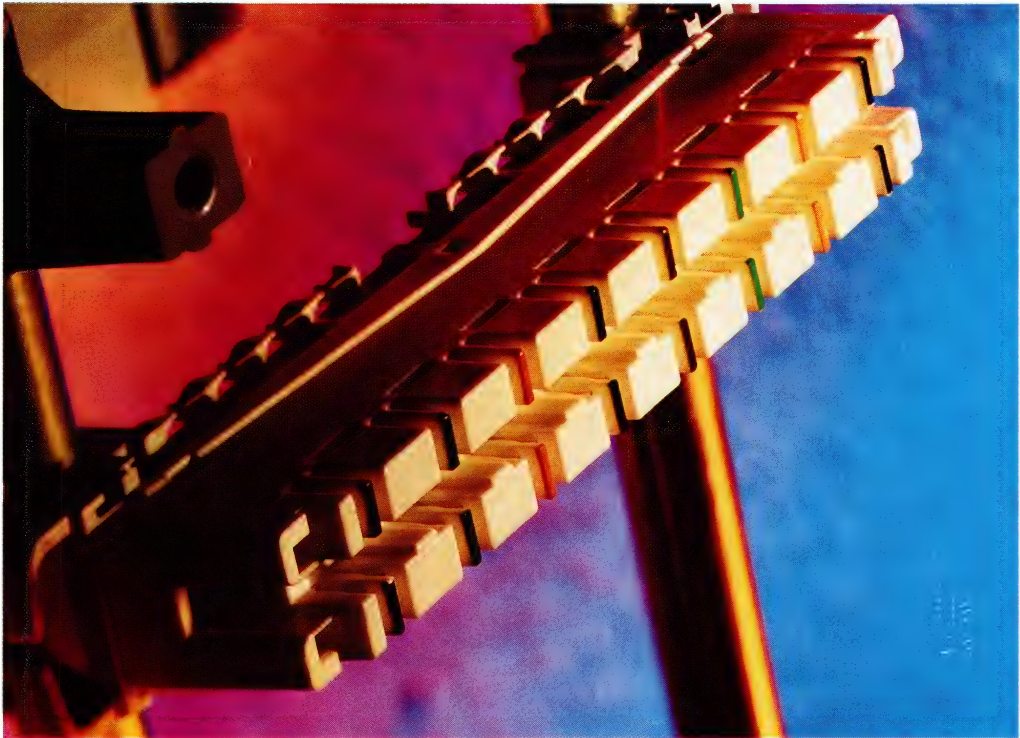








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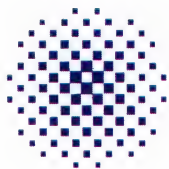
disturbing the IDC connection and the port makes possible patch-by-exception cross connection)

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formance when dealing with large file sizes rather than lots of very small files.

Avail and Palindrome go a step further with a feature known as pre-migration. This allows the network manager to elect to migrate files before the watermark has been reached. With pre-migration, two versions of the same file coexist on the local area network. One version is left in place on the original file server. The second sits on the storage device.

Pre-migration meets a specific need — allowing the HSM application to quickly free up room on the server hard disk as required. For example, if 1GB of storage capacity is available on a server hard disk, but a user needs to restore a 2GB file, the HSM applications from Avail and Palindrome automatically dump the server-resident versions of any pre-migrated files to make room for the bigger file.

Some products, like those from Advanced Software Concepts and Cheyenne, offer a wide variety of additional rules, allowing network managers to exempt certain data files from ever being migrated. For example, parameters can be set to permanently protect the files created by a certain user, such as the CEO of the company, or with certain extensions, such as .BAT, .COM, .DLL, .EXE.

Regardless of how well they work, HSM products won't be of much use if management interfaces are too arcane to figure out. Some vendors have put more work into this aspect of their products than others. For example, while the Cheyenne HSM and Novell MSS products run under Windows, users of Alphatronix, Avail, and Palindrome HSM offerings must deal with a clunky text-based interface.

## Screen Savers

While net managers may like HSM's ability to simultaneously pare costs and shave time off LAN administration tasks, LAN users are likely to give it a very different reception when file retrievals suddenly start to take minutes rather than milliseconds.

In an attempt to soften the blow to response times, Avail, Cheyenne, and Palindrome all offer optional TSR (terminate-and-stay-resident) programs for user PCs. The TSRs flash a message on user screens telling them that it may take longer than usual for their file to open because it has previously been migrated. The Cheyenne and Palindrome TSRs also give users the option to abort the file request completely if they aren't prepared to wait.

With products that do not provide a TSR, network managers must find a way to get users conditioned to the fact that requests for older files may take some time. Otherwise, administrators can expect a barrage of calls complaining about delays or reporting phantom faults.

**Stephen Saunders**

## Technology Update

### ■ New Weapon for Network Troubleshooters

From this month, network physicians will have a speedy new tool at their disposal. Unlike conventional cable testers and LAN analysers, Psiber Data Systems' new Psibernet 1000 can test wiring without the need to be physically connected. Users simply insert the cable into a pair of jaws on the handheld unit, and can get a traffic reading in as little as 15 seconds, compared with more than five minutes with many other testers and analysers. Using very high frequency magnetics, the unit 'listens' to data through the outer jacket of UTP cable, and is currently being tested to see whether it will work with coax and STP. At present functionality is, however, confined to detecting the presence of data, limiting the unit's usefulness for pinpointing component faults. A version which can perform frame analysis and cyclic redundancy checks and provide collision analysis is due next year.

### ■ A Workaholic's Dream Come True

Researchers at Olivetti in the UK have invented a way to get your work to 'teleport' to you when you're away from your desk. Workaholics only need wear a special 'active badge' which periodically emits infrared identification signals that allow a network of sensors to keep track of your location. When inspiration hits, you simply push a button on the badge, and preselected files from the Unix workstation in the office 'magically' materialise on the closest machine to hand. The system, which is still in its experimental stage, was originally developed to work only over an ATM network within the Olivetti lab, but lab director Andy Hopper now has it set up to send files to his home after he establishes an ISDN call.

### ■ Intel/AT&T Strategic Alliance

Industry giants Intel Corporation and AT&T have joined forces to develop PC-based videoconferencing technologies and services, including multi-vendor interoperability for conferencing across the WORLDWORX network, which will allow a transparent connection between H.320-based systems and Personal Conferencing Specification-based products. Intel has been working hard in recent times to set up a veritable flurry of wide-ranging alliances. Other recently announced Intel strategic partners include Telecom (desktop video systems), Microsoft (the Tiger project), Hewlett-Packard (advanced workstation technologies), a consortium including BT, France Telecom, DBT, Nortel and IBM (multimedia), and a group of US firms (cable TV).

### ■ Microsoft DSP Resource Manager and Speech API

Microsoft has announced widespread industry support for its Digital Signal Processor (DSP) architecture and Resource Manager Interface (RMI). Aimed at Microsoft 32-bit Windows platforms, the RMI provides a mechanism for managing signal-processing resources such as those found in DSPs. Industry support for the DSP architecture has so far come from Compaq, Creative Technology, Spectron Microsystems, Intel, IBM and AT&T. Microsoft has also announced the availability of an open speech API spec for enabling applications to make use of native speech recognition and text-to-speech capabilities.

### ■ Largest, Fastest Gate Array

Chip maker Rockwell has announced what it claims is the largest, fastest gallium arsenide (GaAs) gate array, yet available, the LI1000. A member of Rockwell's Lightning family, the 5GHz digital gate array is specially designed for use in high-speed digital communications applications including SONET and ATM equipment.

### ■ DMTF Completes MIF Spec

The Desktop Management Task Force (DMTF) has released its new MIF (Management Information Format) spec. Once incorporated into products, the spec will reside in various PC components as an ASCII file, and will define how motherboard, CPU, operating system, BIOS, I/O, adaptors, modems and other devices interoperate and are managed, providing systems with a degree of 'self awareness.' A number of vendors are now at work on MIF-compliant devices, including AST Research, Dell Computer, Compaq, Intel, and HP.

### ■ IBM Releases Video Decoder

IBM has announced its new MPEG-2 chip, a decoder which can render high-speed video to PC and TV monitors, and which has been developed to meet expected demand for faster compression. The chip decompresses either MPEG-1 or MPEG-2 digital video data, providing full-color and full-screen CCIR601 resolution at speeds of 4Mbps to 15Mbps. It features an error concealment device which maximises the use of available good data and supports aggregate DRAM configurations to store coded information, partially decoded video and reference pictures needed for motion compensation. The chip can be used for television set-top boxes (cable converters) for interactive TV delivery and video-on-demand applications, and has already been taken up by Videotron in Canada.



## Convergence

## Carriers Look to the Electronic Market

After years of providing little more than rudimentary value-added services, carriers worldwide are now hammering together what they're touting as platforms for next generation inter-company communications over the public network. The new services go beyond the usual e-mail and EDI applications to offer a range of functions, including global directory services, access to information servers, and even interactive groupware sessions involving users from different organisations.

These emerging products constitute what amounts to electronic commerce services for corporate customers. The new services provide much of the software infrastructure needed to establish links between different companies, including high-level routing, operating system interfaces, and security.

Carriers say their new offerings will be based on off-the-shelf technologies and applications, such as NetWare Directory Services from Novell, the Lotus Notes groupware package from Lotus Development, and the SMTP and MIME e-mail protocols now widely used on the Internet. This means the new services won't lock organisations into a carrier's proprietary technology — a limitation that has stunted interest in value-added services up to now.

For software vendors, interest from the carriers represents a huge and potentially

highly lucrative opportunity. Lotus is one vendor that has been aggressive in courting the telcos, desirous of getting its Notes groupware package onto carrier services. Its efforts so far have met with US success — the vendor has signed a deal with AT&T to make Notes available on the carrier's NetWare Connect Services business network, and has also announced that it has entered into a partnership with Intel to develop videoconferencing capabilities for Notes. Lotus is also believed to be holding discussions with Australian carriers and service providers regarding offering value added services based around the Notes technology.

For carriers, the new services represent a way to cash in on the electronic marketplace frenzy that has made the Internet such a hot ticket in recent months. By cobbling together services that extend basic internetworking functions, carriers hope to attract companies that want an easy-to-use forum for electronic commerce managed by a provider that can be held accountable for all aspects of the service, including the physical links.

### The Race is On

The first US carrier out of the starting blocks with an electronic commerce offering was Sprint, which rolled out its Sprintlink Plus service earlier this year. AT&T NetWare Connect Services, announced by AT&T in May, is now in beta test and is scheduled to be available in the first half of next year. MCI Communications hasn't yet announced any plans, but the carrier says it is looking into developing some kind of electronic commerce package.

The electronic commerce services differ from earlier value-added carrier offerings in

several respects. First, they're based on established technologies and applications available from independent vendors. Older services, such as Sprint's Sprintnet X.25 offering, are based on proprietary software and front ends. Not only does the proprietary approach limit interoperability, but it also narrows application choices.

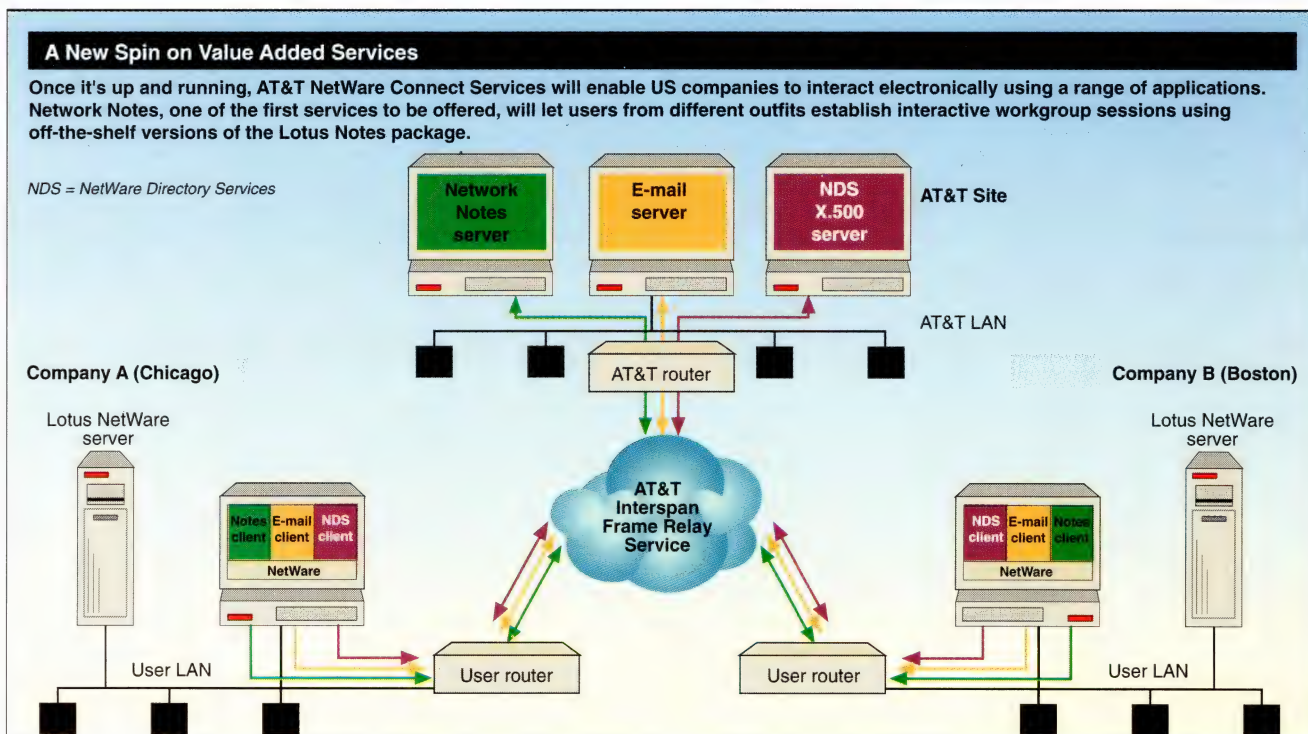
Because they supply users with a working software infrastructure, electronic commerce services will enable companies to set up their own applications for interacting with business partners. For instance, a manufacturer could set up an inventory database that will allow its customers to determine whether stock is on hand to meet a specific order.

Support for widely available network transport protocols such as TCP/IP and IPX is enabling carriers to offer mainstream applications to subscribers. AT&T NetWare Connect Services handles both TCP/IP and NetWare IPX traffic, while Sprintlink Plus is a TCP/IP service.

The days in which service providers control the kinds of applications available to users are over, according to Martha Hanlon, Director of electronic commerce product management at MCI in the US. "I don't think a vendor is doing you justice by offering proprietary solutions today," she said. MCI now offers an EDI service over Tymnet, the X.25 network run by BT.

X.25-based services like Sprintnet and MCI's offering don't go beyond e-mail and EDI in terms of applications. But the new services promise a wealth of applications, including interactive groupware, informa-

*Continued on page 42*





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## Rolling Along the I'way

For many of us, the world of the Internet has long been a source of great frustration — not about how it works, but how to get on it. I've been trying (along with an association of a couple of dozen technical journalists) to get full access for years. Unfortunately we didn't fit into the narrow university student or research-fellow category, and so we were regularly rejected — although a few of us managed to sneak onto the net through cracks in the back door. The only legitimate access we could get was to have an e-mail address through one of the commercial providers.

But about six months ago it appeared that, for the first time, we were to be allowed formal access. The Australian Vice Chancellors' Committee (AVCC) which oversees AARNet (Australia's official link to the Internet), had finally dragged its collective heads out of the sand, and OK'd an 'opening up' of the net to the wider world. But the costs killed us. The National Science and Technology Press Association was approved for access, but an all-up cost estimate of about \$20,000 for the PC, software, dial-in and leased lines and connection fees, shot down the whole project.

This cost problem is one that many individuals and small companies face in getting access to the Internet, but fortunately there are now numerous organisations providing these services, and you can buy them at a number of different levels.

### Types of Access

AARNet first divides its customers into Members and Affiliates. The Members are the universities and CSIRO; Affiliates are everyone else. These Affiliates are further subdivided into Value Added Resellers who are allowed to on-sell all IP services, and non-VARs who are permitted to sell e-mail services only.

Commercial Internet electronic mail services have been around for many years, but it is the opening up of the VAR business which is a relatively new phenomenon here. With the publicity the Internet has been getting lately, most of the service providers are at least doubling their business each year, so business is booming and becoming highly competitive.

What distinguishes the Internet itself from its many peripheral links, is that what can be characterised as the 'true' Internet (which includes AARNet) uses the standard Internet Protocols throughout and also a standard three-level addressing system which establishes various Internet 'domains.' You can gateway to Internet e-mail

through a service like CompuServe, but you need to use a special form of CompuServe addressing, which is then translated at the gateway.

Casual dial-in e-mail users will be provided with an address which is within the domain of the service provider, but if you have a permanent connection running IP protocols, you can have your own distinctive address domain. However, this doesn't mean that you must have a permanent link to the Internet to have your own 'address domain' — if you wish, you can become acme.com.au within the rented space of a service provider, and still use dial-up access. It all depends on what the service provider is willing to provide.

AARNet connects to the United States system over a couple of T1 lines running at 1.54Mbps, and this connection is half-financed by NASA. It is this, and the use of in-house university computers as the main AARNet nodes, which makes the operation of this service extraordinarily cheap. In real-cost terms, each Australian university must set aside about \$12 per student per year to run their international e-mail and file transfer services.

The universities now see commercial service providers as one way to recover some of their lost taxation revenue, and provide a financial avenue for further network development. For any computer or network to have access to the Internet through a commercial company, full-time Internet Protocol links must exist between the VAR company and a node — which is usually in the nearest university. The university will then charge a minimum of \$8,000 for use of a port, and Telecom will collect a bundle in tie-line fees.

The services that are available at the VAR are then reasonably standard. The market differentiation depends more on the number of ports available for direct connection, the type of modems used, number of dial-in lines, the front-end software, etc.

As an example of the range of Internet services (and as an introduction to Internet gobbledegook), Kaye Scott of the Uni of Western Australia's Winthrop Technology organisation, says that her clients "have access to menus, e-mail, irc, www, netlib, screen, news, hytelnet, gopher, muds, arns, fsp, ftp, pgp, rcs, zip, kermit, zmodem, tcsh, pico, pine, zip, archie, zsh, ksh, emacs, uemacs, nn, tin, mime, matchmaker, talk, angband, conquer, fortune, greed, jumble, nethack, omega, poker, scrabble, solitaire, larn, warp, yahtzee, chess, othello, ibs, ics, igs, moo, etc., et al, ad nauseam . . ."

If you want permanent connection to the network to do all this, you'll need, at a minimum, a leased phone line, the investment in two modems, and some sort of an IP-capable computer. At the low end the computer will typically be a Unix box, or a PC running NetBSD or Linux.

Most users are content to have only a dial-in connection for e-mail, and, if they can have a menued front-end instead of DOS-type prompts, then so much the better. However, as these services move out of the hacker niche and into the wider world of commerce, better GUI-based front-ends are becoming essential.

Most of the VARs either provide or sell Windows and Macintosh software to soften-down the Unix-shell for casual users, and some are developing quite sophisticated software. Shareware is quite common also. In some cases, however, you'll find that PC access is terminal emulation only, and if you are lucky Mac clients can use AppleTalk Remote Network Services over the dial-in lines.

The main protocols now used for Internet connection are UUCP, SLIP and PPP. UUCP (Unix-to-Unix Copy Protocol) is ideal for low budget, low traffic situations, and is particularly suited to international e-mail traffic. It is now available for most PCs, including Amiga, IBM and Macintosh. UUCP is mostly used on dial-up links; it sends batches of news articles and/or electronic mail from one site to another — so it can be used externally to automate regular news delivery.

For PC modem-based permanent links, SLIP (Serial Link Internet Protocol) and PPP (Point-to-Point Protocol) handle packets over serial lines. SLIP is ideal for research, post graduate studies, commercial access, etc. where on-line access is needed.

These protocols are used to tie together the main IP nodes, but they can also reach out to office-based machines — mostly over permanent lines, but dial-in can also be used. You have access to the full range of Internet services with SLIP or PPP.

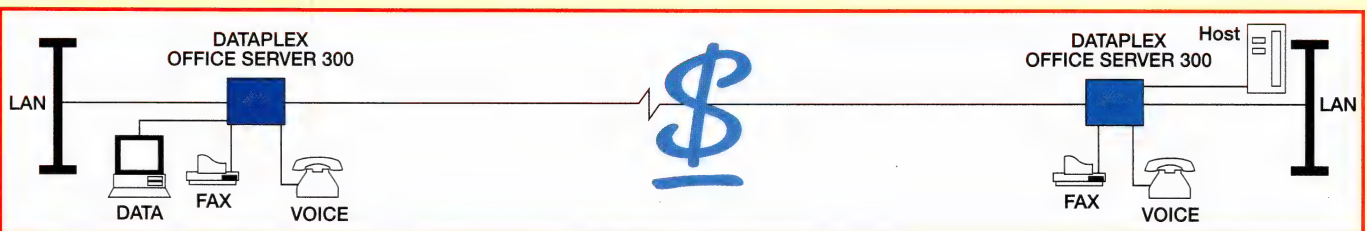
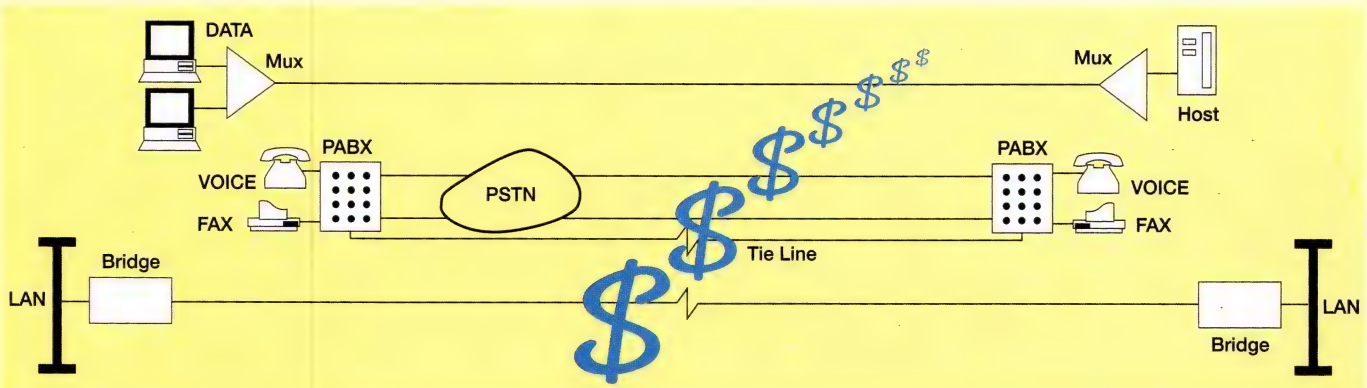
### Service Providers

Connect.com and Pegasus were probably the first public access services offered in Australia, and they are still two of the most active. Connect.com now has a presence in all mainland States, and it provides the technical facilities needed by some of the other non-commercial services. The company announced a first last month with a decision to bypass AARNet and establish its own link into the Internet in the US. The 64Kbps link will connect to BARRnet, a large commercial Internet provider. The company's AARNet link will still be maintained, but the new link will provide access to an additional 6,000 IP networks.

Connect.com's NSW and Victorian capital city nodes each have a TCP/IP communications server with about 50 dial-in lines (plus some permanent connections). TCP/IP routers are installed in the smaller centres, each with about 10 incoming lines. It now offers everything from basic e-mail and Usenet news service (using dial-up UUCP). If your company needs a direct



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<b>Cameo</b>	<b>AH1000</b>	<b>12</b>	<b>Y</b>	<b>Y</b>		<b>Y (Two)</b>
Digital	Demon	5	N	N		N
Digital	DECrepeater 90T	12	N	N		N
Cabletron	MRXI-22	12	N	Y		N (Upgradeable)
Cabletron	MR9T 10BaseT Multi Port Repeater	9	N	N		N
NetWorth	EtherNext	9	N	N		N
IBM	8222 Workgroup Hub	6	N	N		Y
Adder	Hub-8	8	Y	N		Y
SMC	SMC 360 8TP	8	N	N		Y
SMC	SMC Elite 351 2TP	12	Y	Y		Y (two)
Asante	NetExtender Hub	4	N	Y		Y



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permanent connection you can rent full TCP/IP access, and Personal IP is also available for people who want to keep arms-length from the Internet, but still log on and use it as a full interactive service.

Magnadata is a much smaller commercial operation which claims to have "about all the commonly-used Internet applications installed on our system, and quite a few uncommon ones," as Luke Carruthers says. Even better, "if there is an application not installed that someone wants, we are happy to install it," he says.

Magnadata also offers related consulting services, from integration of existing e-mail systems with Internet mail, to planning and implementing a corporate presence on the Internet. As Carruthers points out: "Access is not much good if you don't use it effectively!"

APANA provides the contrast here. It sub-leases Connect.com's facilities in most States, but philosophically, it lies at the other end of the spectrum to the commercial services. APANA is not a service provider or value-added reseller; rather it is a group of enthusiasts who have pooled funds to sub-lease links for their own use.

You can join APANA and they will help you set up and operate on the Internet at a number of different levels (dial-in and permanent links, etc.) but you must not use their facilities for commercial purposes.

Brisnet (Brisbane Public Access Network Association Inc.) is another not-for-profit organisation but it doesn't mind some very limited commercial activity. It prides itself on being cheap, and not having time or volume charges. It has two 14.4Kbps links to the outside world; one directly to AARNet for a news feed, and one to Connect.com for everything else.

There are special industry services also available through some of the more specialised service providers. The Message eXchange (TMX), for instance, promotes Clarinet which is an electronic publishing service. It provides professional news and information, including United Press International (UPI) news, as well as international computer news and material for other major interest groups. TMX keeps its entry costs to the Internet low by using store-and-forward. You then only pay for the time it takes to transmit the data to their system.

There are too many services now to summarise them all, but the table on page 41 will provide the basic information. Be warned that the charging methods are complex and it is quite impossible to set all the variations out in any meaningful form. Before you make any decision, ring a few possible choices and get their printed materials. You might also like to ask for the names and phone numbers of some satisfied customers, so that you don't need to take all these claims on trust.

**Stewart Fist**

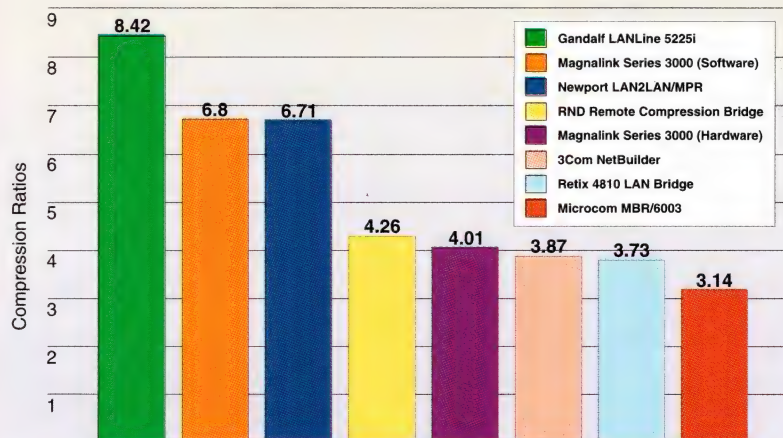


## A Sampling of Internet Service Providers

NAME	ACCESS	SERVICES	COSTS
<b>APANA</b> Warwick Hockley Tel: (03) 571 0484 E-mail: propaganda@apana.org.au	Via Connect.com to Sydney, Melbourne, Brisbane, Adelaide and Canberra. Various dial-in or permanent lines	Dial access to Internet-connected systems (telnet, ftp, gopher, e-mail, news); UUCP feeds (e-mail, news); dial-up/permanent IP Internet connectivity (SLIP)	\$20 joining fee plus \$50 p.a. A dial-in account costs an additional \$70 p.a., + other costs depending on type of connection
<b>AUUG</b> John Barlow Tel: (06) 249 2930 E-mail: john.barlow@anu.edu.au	Canberra only, one dial-up line. Available to members only	E-mail, news, and some locally-cached software sources	Membership cost of \$90 a year. No access or time charges
<b>Brisnet</b> John Lemon Tel: (07) 372 5296 E-Mail: john@ozspace.brisnet.org.au	Brisbane only: 2 dial-in account lines and 2 UUCP/SLIP lines each hub plus 4 permanent SLIP connections with dedicated 24-hour phone line and modem	E-mail, news, ftp, telnet, World Wide Web etc. Some account options (e.g. UUCP) only have mail and news.	Six rates from \$80 p.a. (e-mail only) to \$170 p.a. (SLIP mail/news/IP), each with 1 hour daily free access time; permanent SLIP sites at \$550 p.a.; no time or volume charging (except block usage times)
<b>Commercial Software (CSTPL)</b> Paul Burr Tel: (07) 875 1238 E-mail: paul@cstpl1.cstpl.com.au	Brisbane and Mackay Qld, via UUCP or SLIP (9.6Kbps)	Dial-up e-mail and usenet, etc.	UUCP: Brisbane from \$450 to \$850 p.a. (add \$1000 p.a. from Mackay), with 4MB of free data per week. Additional volume and distance charges; SLIP: \$2,500 connect, plus \$1,000 p.a. maintenance fee. Some other charges
<b>CONNECT.COM</b> Joanne Davis Tel: (03) 528 2239/1-800 81 8262 Fax: (03) 528 5887 E-mail: connect@connect.com.au	Sydney, Melbourne, Perth, Brisbane, Adelaide, Canberra. Approx. 50 dial-in lines in Melbourne and Sydney; 10 each in other capitals.	E-mail, news, ftp and most other Internet; UUCP, SLIP and PPP protocols; dial-up and permanent connections plus ISDN	\$95 registration, \$20 per month plus \$9 per hour above first two hours; basic access: \$2,200 p.a. plus \$300 establishment cost. A range of other prices on application
<b>Corinthian</b> Richard Perini Tel: (02) 906 4333 Fax: (02) 906 1556 E-mail: rpp@ci.com.au	Dedicated links only. Points-of-presence in Sydney, Melbourne, Adelaide, Perth, Brisbane, Cairns, Canberra and Newcastle	Dedicated SLIP to 19.2Kbps, Sync (router-based) IP to 64Kbps, MHSnet and UUCP feeds	On application
<b>Dialix</b> Justin Sullivan Tel: (02) 948 6995 E-mail: justin@dialix.oz.au	Dial-up lines: Perth 20, Sydney 15, Melbourne 10, Adelaide 7, Canberra 4, Brisbane 3	E-mail, usenet, ftp, telnet, irc, talk, finger, rlogin, gopher, unix system, UUCP	No subscription, monthly or annual charges; 1 cent/min online + 1 cent/1,000 bytes for non-DIALix e-mail & ftp in or out (AARNet/ Internet); prepayment of \$10 (individuals) or \$250 (organisations) held in credit.
<b>HiLink Communications</b> Daniel O'Callaghan Tel: (03) 899 9770 E-mail: info@hilink.com.au	Melbourne area. Four access lines	E-mail, usenet news, WWW cache, WWW server for customer product catalogues, etc. All Windows/Mac interfaces. UUCP, casual IP, Permanent IP	UUCP \$75 establishment + \$90/quarter; IP (SLIP/CSLIP/PPP) ranging from casual (\$75 subscription plus hourly and volume charges) to permanent connections (from \$1,400-\$1,700 subscription + \$500-\$600 per quarter and \$1.40 per MB)
<b>iINET</b> Michael Malone Fax: (09) 307 8414 E-Mail: iinet@iinet.com.au	Perth Metro Area only. Twelve access lines	Dial-up single user access for e-mail, ftp, news, remote login, irc, lynx, gopher and all other standard facilities. Members can use SLIP or PPP to connect at no extra cost; dial-up IP or UUCP for LAN interconnection on a periodic dial-up basis; semi-permanent IP or UUCP for companies connected via a leased line.	Dial-up single user: setup cost of \$15 and monthly fee of \$25. First monthly \$10 volume charge included. Dial-up LAN: setup cost of \$150 and \$50 mth. The first \$10 of traffic is free, then \$1.50 to \$2 per MB. Semi-permanent: about \$600 establishment fee + about \$70 per month + traffic charges
<b>MagnaData</b> Luke Carruthers Tel: (02) 264 7326 Fax: (02) 264 7308 E-mail: info@magna.com.au	Sydney with 16 lines (up to 28.8k) and soon in Melbourne and Canberra with at least 8 lines	A range of different services. E-mail and news. The Unix shell is fully enabled, and can use telnet, ftp, lynx, etc.; SLIP/PPP on a dial-up or dedicated basis	Basic: e-mail and news \$100 p.a.; SLIP/PPP: \$40/month; 20MB allowance, then \$2 per MB; Base corporate connection: \$160/month with 60MB allowance and usage by 4 people. Extra staff \$40/month each, 20MB allowance per person. No on-line time charges, only on volume; no set up fees, only account charges
<b>The Message eXchange (TMX)</b> Elaine Pensabene Tel: (02) 550 4448/008 806962 Fax: (02) 519 2551 E-mail: elaine@mhs.oz.au	Sydney, Melbourne and Brisbane. Rotary modem systems	Dial-in store and forward access to e-mail, file transfer; subscription to the news groups; full IP access later this year	From \$50 to \$500 for connection, including software and some connect time. Standard time costs are \$8 per connect hour
<b>OzEmail</b> Gerard Kohne Tel: (02) 437 5500 Fax: (02) 437 5888 E-mail: gerardk@ozemail.com.au	Sydney, Melbourne, Brisbane, Canberra, Adelaide and Perth. More than 200 dial-up access lines	E-mail and usenet; full SLIP/PPP access (terminal access also); software: Windows and Mosaic	\$25 registration fee. No monthly or volume charges. \$10 per hour peak weekdays; \$5 per hour off peak and weekends
<b>Ozonline</b> Michael Bethune Tel: (03) 888 2622 E-mail: info@ozonline.com.au	Melbourne Network Hub has 8 lines currently, plans to add more soon	SLIP based connection with e-mail, ftp, telnet, mosaic, gopher etc.; requires TCP/IP and SLIP software; shareware versions supplied	\$95 registration, \$7.80 per hour peak, \$5 off peak
<b>Pegasus</b> Frank Whitmee Tel: (07) 257 1111/1-800-81 2812 Fax: (07) 257 1087 E-mail: fwhitmee@peg.apc.org	By local dial-up (Brisbane only), telnet or Austpac. Modem rates to 28.8Kbps	E-mail; conferences (Internet and local, 3,000 carried); Internet access including gopher, www, ftp, irc, wais	Once-only \$95 payment (includes software, manual and tutorial); subscription: \$20/month; local access and telnet 15c per min; Austpac 19c to 38c per min. No volume charges
<b>Winthrop Technology</b> Gunter Ahrendt Tel: (09) 380 3564 Fax: (09) 382 1688 E-mail: wthelp@yarrow.wt.uwa.edu.au	Perth, 12 dial-up lines at 1.2 Kbps to 14.4Kbps	Access to all services. PC access is terminal emulation only; Mac clients can use AppleTalk Remote Network Services to connect directly over the dial-in lines. Plan to offer PPP for PC and Mac users	Unlimited connect time and a 10MB disk quota @ \$50 per month, or \$2.50 per hour + \$10 establishment fee with 5MB disk quota. No volume charge



Comparing Compression: Remote Ethernet Bridges



Source: The Tolly Group (as released by Gandalf Technologies)

## Gandalf Ethernet Bridge Rated Tops by Tolly

Gandalf Technologies' LANLine 5225i remote Ethernet Bridge was the top performer in an extensive range of compression and latency tests carried out by leading US testing firm, The Tolly Group.

The tests, which were commissioned by Gandalf, were identical to those undertaken for a Data Comm Test Lab article entitled 'Putting the Squeeze on WAN Costs,' (see the August 1994 edition). They showed the Gandalf bridge had the highest compression and lowest latency of any other bridge tested, including products from Retix, 3Com, Magnalink, Newport, Microcom and RAD Network Devices.

The test bed consisted of two Ethernet LANs connected by a 56Kbps link. A Lanquest Lab Frame Thrower generated the test frames, while latency was measured by a Wandel & Goltermann DA-30 using dual Ethernet analysers.

The LANLine 5225i notched up a compression ratio of 8.4:1, well ahead of the next contender, Magnalink's software bridge, at 6.8:1. Latency (the time a device needs to process one frame) is a good indicator of bridge speed, and the tests showed the LANLine beat the competition with a latency of 6.22ms, followed by Magnalink's hardware bridge with a latency of 7.1ms.

### Carrier Services from page 36

tion servers, directory services, and enhanced security.

Among the applications envisioned for electronic commerce products is a facility called electronic remittance, under which users will be able to order and pay for goods electronically. Although both AT&T and Sprint are talking up electronic remittance as a key application, neither has that kind of service available just yet.

## Under the Hood

Sprint and AT&T have taken slightly different approaches in putting together their respective electronic commerce packages. Sprint is using Einet, a middleware package from Microelectronics and Computer Technology, as a key component for Sprintlink Plus. Einet includes security and directory services enhancements, and it provides a platform for customers and third-party vendors to build user-specific applications.

AT&T opted to base its network interface on NetWare, the dominant network operating system for corporate LANs. The decision to go with NetWare gives AT&T NetWare

Connect a critical advantage over Sprintlink Plus, in that the AT&T service routes both TCP/IP and native NetWare IPX traffic. Other TCP/IP services, including Sprintlink Plus, handle IPX through encapsulation.

The NetWare Link Services Protocol (NLSP) makes it possible to route IPX traffic over the WAN. Before NLSP, routing IPX over the WAN was difficult because RIP (routing information protocol), Novell's previous routing protocol, incurred too much overhead broadcasting update packets. NLSP, which is based on the OSI IS-IS (intermediate system to intermediate system) routing protocol, allows for link-state routing of IPX, resulting in much lower overhead.

## Taking Notes

AT&T's Network Notes, a service based on Lotus Notes, gives NetWare Connect another potential edge over Sprintlink Plus. Support for both NetWare and Notes means users can run any software developed for either environment over the NetWare Connect service. In essence, any application that runs over a NetWare LAN potentially will be able to run over the WAN.

AT&T says Network Notes will be a new version of Lotus Development's groupware package tailored specifically to run over the WAN. With Network Notes, AT&T plans to operate Notes servers in the NetWare Connect network.

The AT&T Network Notes server will contain some sort of administrative database that identifies which users or user groups are to have access to files and documents stored on the server. When users want to establish a Network Notes session, they must log into the carrier server to get clearance. If the requested file is available to them, the server will download copies of that file to each party in the session. Changes made to the file at each site will be forwarded to the server at the carrier site, which will then send the changes along to the other side.

But exactly how the server will handle all these responsibilities is still a question mark; neither AT&T nor Lotus will reveal specific details about Network Notes. For instance, it's yet to be determined how customers will control access rights to specific files, or what level of interaction will be allowed over the wide area.

Administering a Notes server in a multi-company setting could be complex — the administrator on the server side has to keep track of access lists for every corporate subscriber. A company may want its customers to have read-only access to its product catalogues, for instance, but it may want to let its contractors enter bids for different projects. The server administrator must be able to determine which users fall into which categories and then allocate access accordingly. On the client side, net managers also will need a way to track which users have access to which documents.

One of the main attractions of Network Notes is that the client side of the service is an off-the-shelf copy of Lotus Notes, rather than a proprietary AT&T application. Software that works in a conventional Notes environment will work on Network Notes, according to AT&T, and software vendors who specialise in Notes applications can develop third-party software to run over the networked version.

## Directory Assistance

Both Sprintlink Plus and NetWare Connect offer comprehensive directory services that allow users from different organisations to find one another and to learn about products and services offered by different corporate subscribers. The AT&T directory is based on Novell's NetWare Directory Services (NDS), an X.500-based database that keeps track of all the users on the network. The latest version of NDS lists both IP and IPX users, which means a company doesn't have to run NetWare to be included in the directory. Previous NDS versions included only NetWare users.



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Initially, the AT&T directory service will include 'white pages,' or listings of users by personal or company name. AT&T says it plans to develop a 'yellow pages' component that will include paid advertisements. The NetWare Connect NDS will link to the X.500-based Internet directory that AT&T is developing, giving Internet and NetWare Connect users mutual access to both lists.

Sprintlink's Internet link is tighter. For its directory service, Sprint is using Einet Galaxy, which already is used on the Internet. While both NDS and AT&T's X.500 Internet directory services require users to be entered in the directory by some agency, Galaxy is self-creating. When a user accesses a Galaxy package looking for information about a product, service, individual, or organisation, the software automatically searches the Internet's World Wide Web (WWW) and Wide Area Information Servers (WAIS) looking for information about the subject of the search, and returns that information to the user. The scope of the search is the entire Internet, not just Sprintlink Plus.

Because Sprintlink Plus is part of the Internet, users of the Sprint service have access to all Internet resources. With AT&T NetWare Connect, Internet access will be available via a gateway. The gateway will

enable outsiders to send e-mail to NetWare Connect users, as well as enable NetWare Connect users to access Internet resources.

## Information, Please

Rounding out the primary applications available with the first electronic commerce services are information servers and e-mail servers. Information servers are programs that store data in a standardised format that can be accessed by any user with the appropriate interface. Examples include the Internet's WWW and WAIS. Sprint is now installing WWW servers on Sprintlink Plus.

NetWare Connect will use the proprietary AT&T Easylink as its core e-mail service. Other mail protocols handled by NetWare Connect include Novell's Global Message-Handling Service, the Internet's SMTP and X.400, among others. Sprintlink Plus handles any e-mail format used on the Internet, including SMTP and MIME (multipurpose Internet mail extension).

## Security Checks

With both new services, security is intrinsic to the network: anyone using either Sprintlink Plus or NetWare Connect is automatically using the security provided by that service.

And that security is far more robust than on older X.25 services. NetWare Connect

relies on the dual-key cryptography and digital signature technology developed by RSA Data Security. Under the dual-key scheme, only the intended recipient can decode a file or e-mail message; the only way any other user can decode the file is if the sender designates that the file be sent to that user. RSA's digital signature component handles user authentication, preventing unauthorised users from logging in to a server under the name of an authorised user.

Sprintlink Plus security is based on the Kerberos private-key cryptography system. The chief difference between RSA security and Kerberos is that while Kerberos offers user authentication and access control, it requires users to log in to servers more than once on some occasions. For example, a user might have to enter a password once at the beginning of a session, and then re-enter it later, depending on the length of the session.

Chances are Sprint and AT&T won't have the electronic commerce services field to themselves for long. Novell says several US carriers have expressed interest in offering such services, including several regional Bell operating companies. Novell also says Sprint and MCI are investigating ways to match the services offered by AT&T's NetWare Connect.

**Johna Till Johnson**

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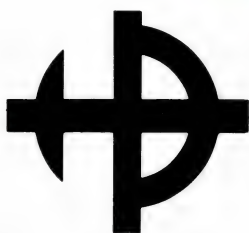
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## A Ticket to Ride the Superhighway

With increasing competition, the upgrading of Telecom's network, and the widespread availability of ISDN in Australia (as well as its relative cheapness compared to the rest of the world), we are poised to see some of the most innovative applications yet to come from the marriage of once disparate technologies.

The explosive growth in voice and data integration in the Australian market is a direct reflection of this. Voice/data multiplexing has raced from a standing start in 1990 to a \$53.9 million equipment business in 1993, and is forecast to grow at an average annual rate of 22.2% to reach \$89.8 million by 1997. Demand for consulting assistance, particularly in the corporate networking environment in voice/data integration, is, as a consequence, strong.

The applications driving growth are many and varied, but none more clearly portrays the kinds of new business applications becoming available than Computer Telephony Integration (CTI). Put simply, this is the integration of the PABX, the telephone, and the corporate LAN or PC to achieve efficiencies and innovations in call handling. This technology is one of the latest examples of the convergence of the IT and communications industries, and has the potential to strain the relationship between the market and the regulators. Given the wide ranging potential uses and the applications already available (and yet to be developed) using this technology, there is almost certain to be a stronger push from business users for access to Caller Line ID (CLID).

Recently trialed in the northern NSW town of Wauchope, CLID has provided the telecommunications industry and the regulator alike with a season ticket to the Privacy Concerns Minefield (see the March 1994 issue of *Australian Communications*, in which Stewart Fist examined the implications of Caller Line ID and the privacy issues from two perspectives — the carriers' and the consumers' [caller and receiver]). Austel advises that Caller Line ID can only be accessed if the telco (in this case Telecom Australia) sends the necessary information down the line. This is only available in Australia where interconnect agreements are in place (for example with AAPT) for billing purposes. At present, though, there

is no further information available on the outcome of the CLID trials, and no decisions are pending.

The use of CLID by these systems, whether apparent to the caller or not, is integral, providing the switch-to-host enabled systems with the capability to receive a call, identify the source of the call and search the databases for the customer details. The telephony server then sends a direction back to the PABX to tell it which extension the call should be sent to. The host then distributes the customer details over the LAN to the same destination. This allows the systems to distribute the customer's call and account details together evenly across the available resources, juggling the inbound and outbound activities of large call centre operations, and laying off the increased inbound activities to the outbound operators when the load requires. Productivity gains of 350% have been claimed.

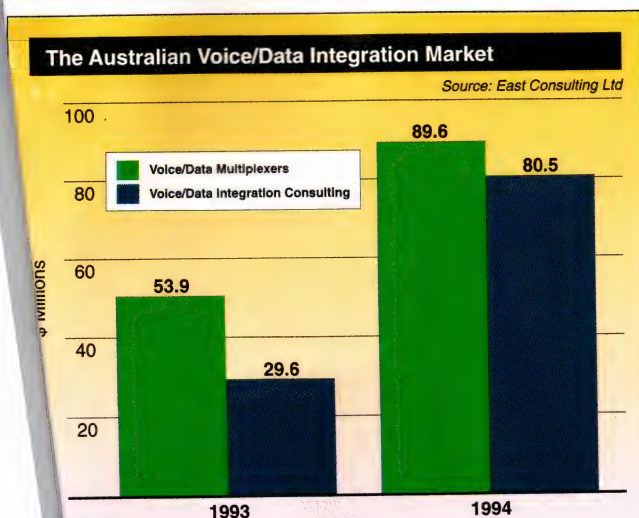
Even if the Caller Line ID question takes as long to sort out as I suspect it will, these applications can still be implemented now by requesting the customer, via Interactive Voice Response on connection, to input their account number, and utilising this identifier for the database search and hand off to an operator.

There are many variations on the implementation of these types of computer telephony integration solutions. The intelligence for these applications can reside in a number of points within the networks — the PABX or the PC or the Telephony Server — and the openness of the architectures which have been developed provide the widest possible access for applications developers. The APIs (applications programming interfaces) are being handed out free of charge both in the US and locally, by the developers (namely Microsoft, Novell and Dialogic).

Just one of the simple yet innovative applications currently available around the world is PC Dialler which, when used in conjunction with a US International Call Back service, can deliver savings in both time and money. PC Dialler dials a US number, rings the distant end once then stops; a few seconds later the PC rings once, and the installed dialler answers. It then bleeps out your desired destination phone number and you're connected through the US International CallBack service as if you were originating the call in the US. What's more, your PC Dialler has already dialled the number, so you're connected in less than 30 seconds. The savings via an international CallBack service, recently approved by the FCC, are in excess of 40% (depending on where you are on the planet) and the cost of this application is \$US150.00. Predictably, PC Dialler has sold 40,000 units in no time flat.

This is just one example of an 'on-ramp' so often referred to in the numerous Information Superhighway articles currently occupying much space in reading material, and represents only the tip of the iceberg in terms of what we can expect. Another major development from the carriers in this area is Advanced Intelligent Networking, which are being developed by the likes of Northern Telecom and Bell Atlantic with a view to the delivery of a wide range of services, including home banking and shopping, over the PSTN.

The figures quoted on this page for the current state of the voice/data integration market will undoubtedly turn out to represent only a small percentage of this rapidly growing market segment.







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# TCP/IP or APPN for 3270? Take Your Pick



Robin Layland

**E**nvironmental extremists and gun lobbyists have nothing on networking vendors when it comes to crafting apocalyptic visions. Destroy one spotted-owls' nest, and put the food chain in mortal peril. Ban AK-47s, and say goodbye to basic freedoms. Choose the wrong networking strategy, and watch the enterprise infrastructure sink into an ungodly abyss.

In real life, of course, consequences are much less dire — usually. The fact that no two corporate networks are exactly alike should be a clear enough sign that there are more than two ways (the right way and the wrong way) to build a network.

But reality hasn't stopped APPN and TCP/IP advocates from proclaiming their respective technologies as the only true internetworking solution. In fact, zealots on both sides now are expanding their campaigns to target 3270 SNA traffic as well as new applications. Those in the TCP/IP camp are advancing Data Link Switching (DLSw) as the answer for integrating 3270 SNA into router-based internetworks; APPN die-hards say Dynamic LU Requester/Server (DLUR/S) technology is the only way to go.

Both sides are right about one thing: 3270 SNA, which remains a vital part of many corporate nets, has to be brought into the internetworking picture. But anyone who argues that there's only one way to do this is at best misinformed and at worst downright deceitful. Over the next few years, both DLSw and DLUR/S will emerge as proven solutions for integrating 3270 traffic into local area networks.

DLSw and DLUR/S both address a core concern: how to integrate 3270 traffic into LAN internetworks without revamping or replacing SNA applications. Because IBM 3270 SNA sessions involve only point-to-point connections between terminals and host front-end processors (FEPs), the addressing scheme used in 3270 transmissions doesn't contain routing information or a routable address. Without that information, the only way to transport 3270 traffic over internetworks is to use simple bridging, which means SNA gains none of the benefits (such as rerouting around failures or better path selection) provided by routing algorithms like OSPF (open shortest path first).

Makers of multiprotocol routers decided to tackle this issue by encapsulating 3270 in a routable protocol, namely TCP/IP. After threatening to annoy users with an assortment of proprietary approaches, vendors last year agreed to base their products on DLSw, the method developed by IBM for its 6611 router.

The DLSw bandwagon is now rolling at full tilt; the completed version of the standard is expected later this year. Meanwhile, vendors including IBM, Ascom Timeplex, Proteon and Wellfleet Communications have been selling pre-standard DLSw implementations. Cisco Systems and 3Com are bringing their encapsulation schemes into line with DLSw.

On the APPN side, efforts to integrate 3270 SNA traffic into LAN internetworks have come late. IBM's original plan was for Advanced Peer-to-Peer Networking to replace SNA; for that to happen, users would have had to abandon their 3270 (Logical Unit 2) communications in favour of LU6.2-based APPC applications.

Hindsight being what it is, we now know that a forced migration from SNA to APPN was almost as likely as a Charles Manson nomination to the US Supreme Court. The arrival of encapsulation schemes like DLSw sent APPN developers scurrying back to the drawing board, where they came up with DLUR/S technology.

Under this scheme, DLUS code, which resides on routers or other internetworking devices, intercepts 3270 session requests and sends those requests to DLUR-equipped hosts (as of now, DLUS is available only for mainframes). The DLUS code locates the needed application and determines a path through the network. DLUS then sends this information back to the DLUR device, which uses APPN's ability to route SNA messages to target applications. As with DLSw, neither the end-station nor the application needs to be changed. Under normal circumstances, the arrival of two different approaches to achieve the same end usually would result in a battle to woo corporate customers. And although some backers in both the DLSw and the DLUR/S camps are gearing up for such a battle, it isn't going to happen. For users, the choice between DLSw and DLUR/S will be dictated by the nature of their backbone networks. Those opting for TCP/IP will use DLSw; shops that stay with IBM's networking blueprint will use APPN and DLUR/S.

Because of its late start, DLUR/S has yet to make it into the networking picture. By my estimates, about 75% of all corporate networks now use simple bridging to shunt 3270 SNA traffic over LAN internetworks, while 25% now use some form of TCP/IP encapsulation, including DLSw. But those percentages are set to change dramatically over the next few years. DLUR/S will emerge in 1995, with the arrival of products from vendors like IBM and Data Connection which provides APPN code to a range of vendors. My guess is that by the end of the decade, about half of all corporate networks will be using DLSw, with about 40% using DLUR/S and the remaining 10% hanging on to the bridged approach.

Of course, these fearless predictions are subject to some change if more options become available — a distinct possibility, given the networking industry's self-destructive tendency to fragment market segments. It wouldn't surprise me if Novell were to come out with a version of DLSw using IPX instead

of TCP/IP as its backbone protocol. And IBM, which created DLSw, could decide to offer a DLSw version that uses APPN instead of TCP/IP.

But even if more pretenders emerge in the marketplace, DLSw and DLUR/S will still remain the two main options for handling 3270 traffic in LAN internetworks. For network managers, the real issue is which approach works best with their backbone protocol. And although advocates on each side will certainly argue differently, both APPN and TCP/IP are strong enough to do the job. Regardless of what you might hear on the trade-show circuit, DLSw vs DLUR/S is a non-issue.

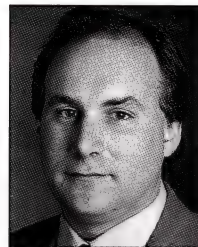
*Robin Layland is a consultant specialising in internetworking and SNA, and a contributing editor of Data Communications magazine, based in the US.*

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*"Of course, these fearless predictions are subject to some change if more options become available — a distinct possibility, given the networking industry's self-destructive tendency to fragment market segments."*

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Graeme Le Roux

## When Q&D is the Only Option

In spite of the fact that the management of most companies these days has come to recognise their company's network installation as critical to basic operations — largely because of its price tag — many managers are completely ignorant of the time which major re-configurations, upgrades or new installations require or the level of planning needed.

The result is that there are times when network administrators are called upon to generate and execute plans for such projects on the basis of little or no useful information and on a ridiculously short time scale. When this sort of thing happens subtly and sophistication have to be unceremoniously tossed in favour of that most time honoured of IT techniques — Quick and Dirty.

The trick, as always, is to apply the technique correctly. So what do you do when, for example, you have three days warning that you have a month to plan and commission a 500-user network?

Firstly, you must prepare to hand your desk over to an assistant for most of the next month, then advise a minimum of two and no more than three competent people to do the same, find a source of 24-hour food (you will be burning the midnight oil on this one and you won't get regular meals), ensure that you and your team have security clearance to remain on the premises after hours and make management aware of the situation, get permission to dispense with any tender process which your company uses, and make them aware that time costs money.

You will also need priority in getting purchase orders, etc. If nothing else, this should get you involved sooner in future projects and it might even get you a reasonable time scale — particularly if a tender process must be adhered to. By the end of the first day you should have your team assembled and in possession of as much information about the new site and the system required as possible. Typically this will consist of a set of floor plans, a list of contact names (architects, contractors, purchasing officers, vendor contacts and so on) and a collection of notes regarding known special requirements. You should also have files of product specifications and your company guidelines for networks. And importantly, you should keep this sort of information on hand and in a reasonably concise form.

The next thing to do is put together a few — no more than a half-dozen or so — basic rules for the team to work from, start assigning responsibilities to team members and visit your new site. These basic rules should be such things as; a project time scale of two weeks rather than a month; Category 5 cable saturation for horizontal runs; fibre in the risers for data, etc.

Rules should be based on practicality and your existing network guidelines. For example, cutting the project time scale to two weeks provides a necessary margin for error; rush jobs always run over time and budget so having prepared the powers that be for the cost of doing the job quick you give yourself time to handle to consequences of doing it dirty.

Most companies these days have adopted Category 5 media as a standard; saturation cabling of the new site with Category 5 media is both Quick and Dirty. Basically what you do (assuming your

phone system will permit it) is pull four Category 5 cables to each office, and terminate two of them for voice and two for data.

While most offices will require only a single telephone and network connection, there are sure to be exceptions which you will not be aware of until the users move in. There will be someone who needs two telephone lines or two LAN connections, or there will be a 'spare' cubicle which has four printers connected to the LAN.

People will be working on site around the clock and they will get tired; there will be mistakes made during termination — the wrong type of RJ connector being put on telephone or network cables, for instance. Assuming you can use it, saturation cabling provides some insurance against such problems, although at a higher capital cost. At worst you might have to re-terminate some offices, but you won't have to pull more cable and you won't have to source a concentrator/MAU in a hurry.

Another reason for using Category 5 cable for your network is that is likely to be the only type of network cable you can get in bulk in a hurry. For similar reasons you will have to use the likes of AT&T, Krone or DECconnect structured cables systems; it will be difficult to get anything else supplied and installed in time. You should also order about 10% more cable than you plan to use; if you don't you will need that extra roll of cable (or 20 RJ-45 connectors) at an hour when you can't even get a pizza delivered.

The installation and testing of your cable system will, being necessarily labour intensive, take some time. As a result there will not be sufficient time to install, configure and test large amounts of equipment on-site. The quickest way around this problem is to use

a bridged network with a non-routable protocol based on a collapsed backbone and to 'hot stage' — i.e. configure, run up and test — as much equipment as possible. Choose a high end hub which supports switched Ethernet — and C/FDDI if you can — set it up in a conference room and plug your new servers into it for basic configuration and testing.

The reason for choosing a non-routable protocol and a bridged network is simply speed of installation. Bridges are almost plug-and-play when compared to routers; in this case all you need to do is turn 'learning'

on, clear any pre-set custom filters, plug the things in and wait for the Spanning Tree Algorithm to converge.

Using a non-routable protocol you avoid the tasks of planning and setting IP sub-nets. You will need to define a single subnet for management but that is a lot easier than configuring 500 workstations. As for a management console; use Telnet for the duration of the installation and commissioning process.

Once the network is up and running you will have some idea of what management software you need. Always bear in mind that the primary goal of a Q&D solution is to get the system up and running as fast as possible with enough of a safety margin to allow you to find and fix your mistakes and the compromises you will have to make before they have a negative impact on the system as a whole.

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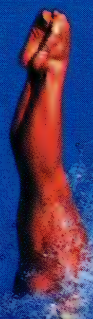
*"Always bear in mind that the primary goal of a Q&D solution is to get the system up and running as fast as possible with enough of a safety margin to allow you to find and fix your mistakes and the compromises you will have to make . . ."*

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*Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.*



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# A One-Box Remote Office Solution

Eicon's IP Router for Windows NT provides another solution for connectivity at the branch office.

A successful WAN solution for small remote offices must balance three factors against cost; simplicity, availability of communications services and practicality. For example, a finely tuned server may cost less than a simple configuration (less memory, lower communications bandwidth), but if it requires on-site support it might be impractical in a small, remote office. On the other hand, a system designed around a simple server and a specific communications service maybe undeployable in country areas due to the required service being unavailable.

Ideally, what is required is a single box providing the necessary functions of a server and communications controller which can be remotely managed and which, with minor configuration changes, can support all possible communications services. Naturally any configuration changes should be transparent to applications and users. This sounds like a reasonably simple design exercise, but in practice it is anything but.

In the Australian environment it is common for many companies to have literally hundreds of branches around the State or even the entire country. Many of these branches will be in locations where ISDN, DDN or leased line X.25 services are not available, or are too costly for a small branch. It's easy to deploy a PC server at such small sites, and using products like Compaq's Insight Manager and Microsoft's Windows NT it is also possible, with a careful choice of applications, to deploy a solution which can be remotely managed.

The difficult part has always been communicating with such a server in day-to-day use. Many companies solve this problems with bridges, routers, and so on — but using such devices complicates deployment, configuration and support. Put simply, it's something else which can go wrong on-site.

Eicon has spent a lot of time working on ways to provide solutions to this market and has it down to a fine art. Eicon's range of communications cards support almost all available communications services and, most significantly, present an identical software interface — Eicon's Dialler interface — to its higher level applications.

The latest application which Eicon has released for use with its cards is an IP Router for Microsoft's Windows NT. The beauty of this is that a server (or workstation for that matter) in a standard configuration can be deployed at all sites, irrespective of the type of communications service which is available at any given site.

Another benefit is simple scalability; a small site can be established with simple asynchronous modems and, once the site grows, the server's EiconCard can be swapped for another which (for example) provides an ISDN interface with no change to either network operating system or application software configuration. The management interface also remains consistent.

Eicon's IP Router for NT is completely compatible with the company's equivalent products for NetWare, Unix and OS/2. It is also compatible with Eicon's family of InterConnect products and, as is typical of

## PRODUCT SUMMARY

**Name:** IP Router for Windows NT

**Description:** Software-based IP router which, when used in conjunction with any of Eicon's EiconCards, provides low cost WAN interconnection for Windows NT

**Price:** IP Router for Windows NT: \$1,795; EiconCards are sold separately

**Vendor:** Eicon Technology (Australia), Level 14, 33 Berry St, North Sydney NSW 2060 Tel: (02) 959 1960

Eicon, interoperates with standalone routers from companies like Cisco and Wellfleet. This level of interoperability is a boon when a WAN must support several types of NOS and is intended to provide a high speed enterprise backbone to concentrate traffic from numerous small sites.

The IP Router will co-exist with Eicon's WAN services for NT, providing a complete range of wide area connectivity options for NT. Eicon's IP Router for NT supports up to four Eicon cards per server, up to 32 connections per router, complies with all relevant RFCs (877/1356, 1294/ 1490, 1331/1548), supports RIP, PPP, and frame relay, and can use any EiconCard. Eicon Cards support single, dual and multiple ports with V.24 (RS-232 and X.21bis), V.35, X.21 with V.11 (X.27) and V.54 external interface support. Line speeds of up to 128Kbps and data compression options are available.

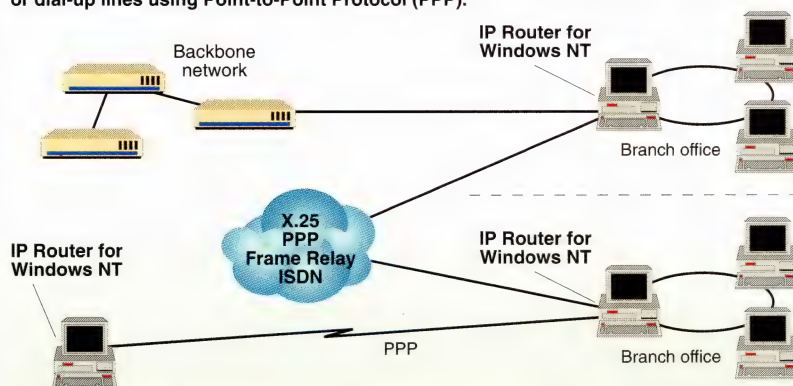
The IP Router for NT in combination with Eicon's communication cards will never compete with high end routers, nor will it handle very high bandwidth applications, but in 90% of router applications line speeds of less than 128Kbps — usually a lot less — are used, there are less than three links per site (one link being most common), and simplicity is all-important. In such situations even mid-range standalone routers are overkill. Eicon's simple, robust approach used in conjunction with a solid hardware platform, a solid operating system such as NT and deployed in a carefully planned topography, are in many cases a near-perfect solution for Australian conditions.

Similar conditions are found in many parts of our region and it is highly likely that Eicon will be able to successfully leverage local experience in regional sales — as would any successful Australian systems integrator.

**Graeme Le Roux**

## Supporting TCP/IP Over the WAN

Eicon's IP Router for Windows NT provides office-to-office connectivity via Windows NT TCP/IP-based LANs over wide area networks and can support frame relay, X.25, and leased or dial-up lines using Point-to-Point Protocol (PPP).





# Short Fat Pipes for NetWare

Kalpana's new NetWare Loadable Module offers a neat solution to the problem of bandwidth shortage at the server.

Many networks, be they small to medium sized standalone LANs or LAN sub-nets in larger networks, run into the problem of insufficient bandwidth at a server. If the cause of the problem is the server itself then an administrator must replace or reconfigure the server. If the bottleneck is due to a lack of network bandwidth to the server, which is most often the case, then the solution is not quite as straightforward, particularly if the server is a PC on an Ethernet-based LAN.

Simply putting more network adaptors — dual- or multi-homing — into the server may do some good, provided your favourite NOS will support it and you can sub-divide your LAN. You have to subdivide your LAN because, even if you are running Unix and TCP/IP with separate IP addresses assigned to each network adaptor, you can't dynamically balance session loads across all adaptors without running specially written applications which select an adaptor after some form of handshaking — which will increase session latency and cost server CPU cycles.

Even if you get over the problem of balancing session loads across adaptors, you still face the task of getting more than Ethernet's single 10Mbps bandwidth to the server's adaptor pool. A repeater or concentrator won't help, and a hub with multiple backplanes to which each of the server's adaptors can be individually connected simply moves the problem to the hub.

To date, the most common approach to this problem, given that a single server cannot be replaced by two or more units (and even if it can, you have to worry about load balancing, backups and data synchronisation), has been to simply install a 'fat pipe'

in the server. Generally one of the copper-based versions of FDDI is used, although some sites are considering so-called 'full-duplex Ethernet.' Unfortunately, the results of deploying, for example, CDDI, in such cases are sometimes disappointing.

A good server with an accurately timed EISA bus will have an instantaneous transfer rate of about 33Mbps, which translates to about 24Mbps when overhead is taken into account, and thus should — in simple hardware terms — be able to drive an C/S/FDDI interface much faster than 10-Mbps, in fact at close to full bandwidth.

Such a server won't attain this speed for three basic reasons. First, the bus will have other things on it such as hard disk controllers; second, driver software is run by the system's CPU, which has other things to do; and third, FDDI in its various incarnations was designed for maximum efficiency in handling large packets between a relatively small, stable number of stations, while the average Ethernet LAN server has to handle large numbers of relatively small packets from an almost arbitrary number of stations.

In the wide area communications environment the solution to the sort of bottleneck described above is to simply aggregate channels, but prior to Kalpana's seeing the light nobody thought of applying the same simple approach to the problem in a LAN environment.

Kalpana's Switch.NLM is simply a piece of software which allows any group of Ethernet adaptors in a NetWare 3.1x or 4.x server to be aggregated into one parallel channel to a Kalpana EPS-1500 EtherSwitch, which is equipped with EtherChannel firmware. EtherChannel is standard on

## PRODUCT SUMMARY

**Name:** Switch.NLM v1.0

**Description:** A NetWare Loadable Module which permits aggregation of full-duplex and standard Ethernet channels between a NetWare 3.1x or 4.x server and a Kalpana EtherSwitch supporting Kalpana EtherChannel.

**Price:** \$890

**Vendor:** Kalpana, Inc.

**Distributors:** Anixter Australia, Tel: (02) 333 0800; Cray Communications Tel: (02) 451 6655

the EPS-1500 (existing EPS-1500s require a firmware upgrade costing \$124).

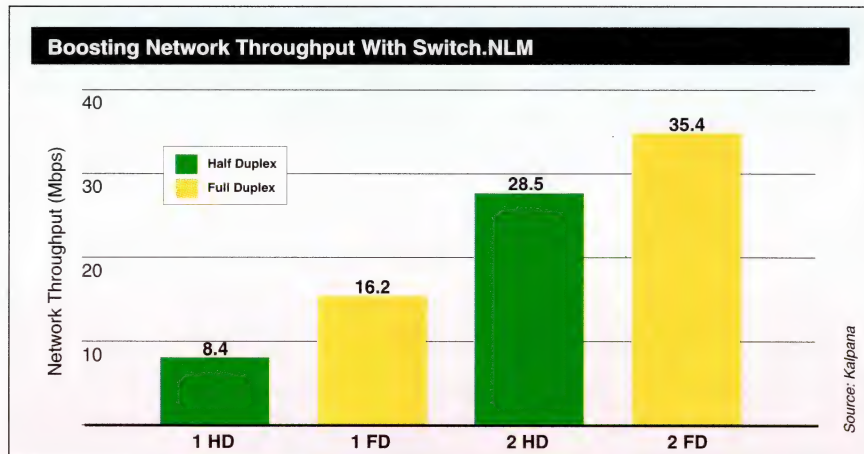
Switch.NLM works with the EtherChannel firmware which permits the same type of channel aggregation between EtherSwitches. Switch.NLM supports any Ethernet adaptor whose drivers comply with the Novell ODI version 4 specification, IBM's EtherStreamer MC32 and Compaq's NetFlex adaptor. Kalpana claims that even when its used in conjunction with two standard Ethernet adaptors, Switch.NLM can significantly increase server throughput.

Another major benefit of Switch.NLM is built-in fault tolerance. Since the software load balances between adaptors a fault in one of them simply lowers server throughput rather than effectively stopping the LAN. Administrators are notified of an adaptor fault via Kalpana's Monitor.NLM monitor which ships with Switch.NLM.

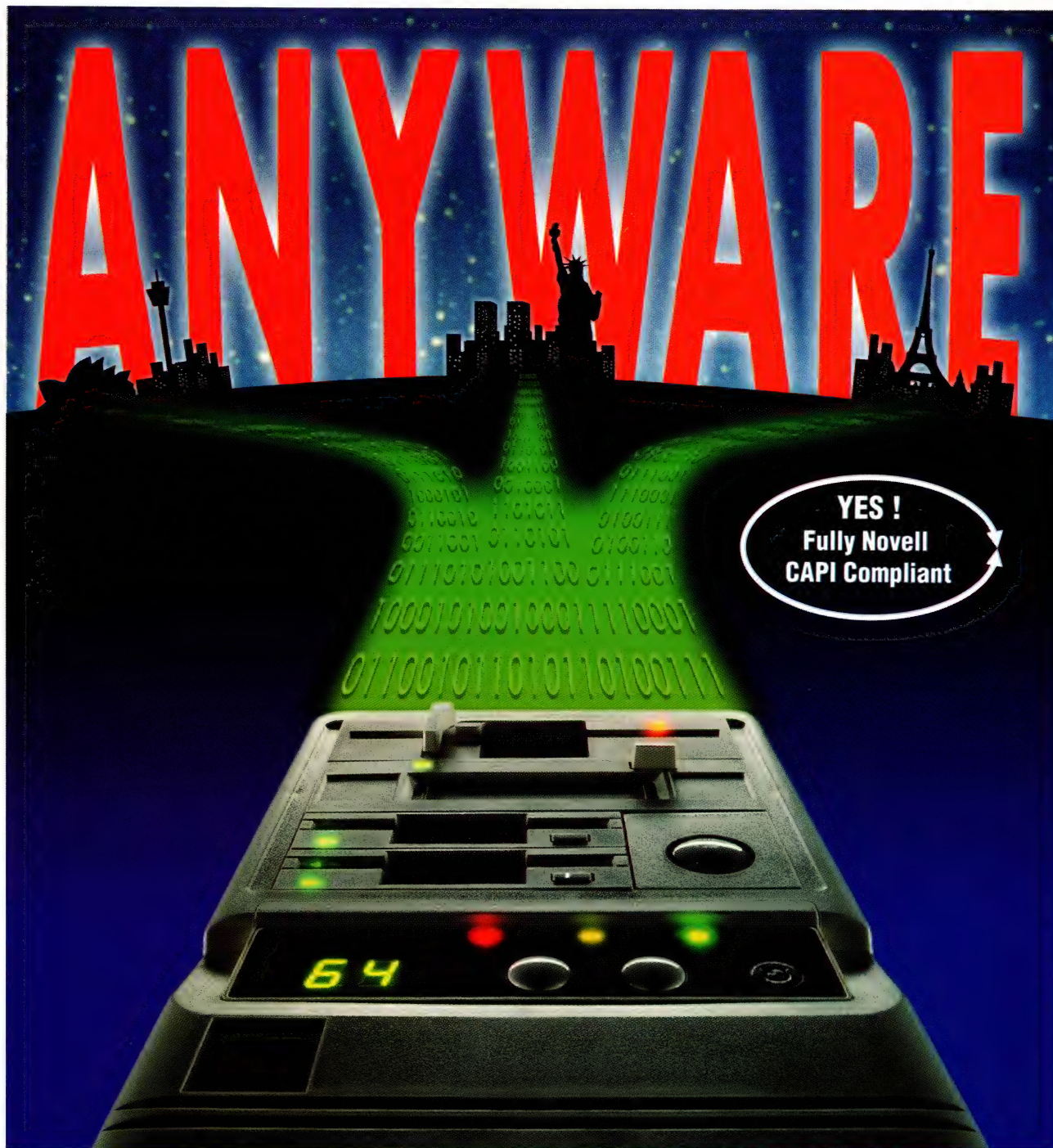
Kalpana's Switch.NLM is a proprietary solution to a common problem designed, necessarily, to work with a specific NOS. It is cost effective and can be used with either standard Ethernet hardware or non-standard (i.e. full duplex) hardware. In all probability most net managers will decide that its benefits outweigh its being 'non-standard' and deploy it without reservation — just as they have Kalpana's non-standard 'switching' Ethernet hubs.

While nobody would argue that standard solutions are the best choice, it must be remembered that standards are developed in response to needs; the needs come first. Perhaps Switch.NLM (which I hope Kalpana will develop for other platforms — such as SCO and NT) should be referred to as 'pre-standard' rather than 'non-standard.'

**Graeme Le Roux**







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# Multiple Choices for Net Managers

Telematics' new ACP 70 lets dollar-wise net managers pick and choose their WAN access methods.

If asked, a savvy net manager could probably tell you exactly which wide area service is the most cost-effective at any hour of the day or night or for a given application. But smart managers also are aware that buying the gear to access the services they'd like to pick and choose from can quickly eat into any cost savings.

Telematics offers a way for managers to exercise their hard-won knowledge to save money on WAN tariffs without losing it again in equipment expenditures. The ACP 70 multiprotocol access device works with a wide range of local and wide area protocols, and its WAN ports can be configured to exploit the thriftiest transmission method according to time of day or type of traffic.

The product combines the functions of a PAD, FRAD, multiplexer, and IP router. While Telematics International isn't the first vendor to take the one-box-does-it-all approach to networking, the ACP 70 offers the additional benefits of allowing managers to configure ports and update the box's protocols locally or remotely.

The basic configuration supplies two 2Mbps ports and four 64Kbps ports plus one AUI Ethernet port. For \$2,400, users can buy a daughterboard that furnishes four additional 64Kbps ports. The ACP 70 can accommodate up to two of these expansion cards. Users have a choice of V.11, V.24, or V.35 physical interfaces.

Managers can configure any of the ports either to accept local equipment or for wide area services. The ACP 70 handles the following local protocols: async, bisync, SD-LC, SNA, IP, and X.25. On the WAN side, ports can work with frame relay, X.25, or IP

services from a third-party provider. By the end of the year Telematics says it also will offer an ISDN basic-rate interface.

The AUI port accommodates one Ethernet LAN. Users on multiprotocol Ethernets should take note that the AUI port will handle only IP traffic. The unit routes IP traffic and transparently bridges all other protocols through the 64Kbps ports. The vendor plans to add IPX LAN capabilities by year's end.

Managers can assign transmission protocols and destinations to each port using the vendor's Net25 network management package. The box also contains an SNMP proxy agent that is able to report to HP's OpenView management platform.

## Service Options

The ACP 70 holds the most promise for support personnel who really have a handle on their systems' traffic patterns and thus can fine-tune the box to fit their network's needs. At setup time — and any time thereafter — managers can configure each port to use a particular transmission method depending on the time of day. For example, users can set one port to dial up service from a third-party IP access provider during the day for LAN interconnect. They can direct that same port to switch over to a more economical frame relay connection in the wee hours for prescheduled batch file transfers. A switch to a secondary transport method also can be triggered by events such as line failure.

The ACP 70 makes the most of its WAN connections by multiplexing multiple types of local traffic — such as X.25 traffic from a router, ISDN traffic from a PC user, and SDLC data from a mainframe — onto the

## PRODUCT SUMMARY

**Name:** ACP 70

**Description:** A multiprotocol access device with integrated PAD, FRAD and IP routing capabilities

**Price:** \$8,400 (incl. one LAN port and 6 WAN ports); additional synchronous data card \$2,400; ISDN BRI \$1,900 (due 1995)

**Vendor:** Telematics International

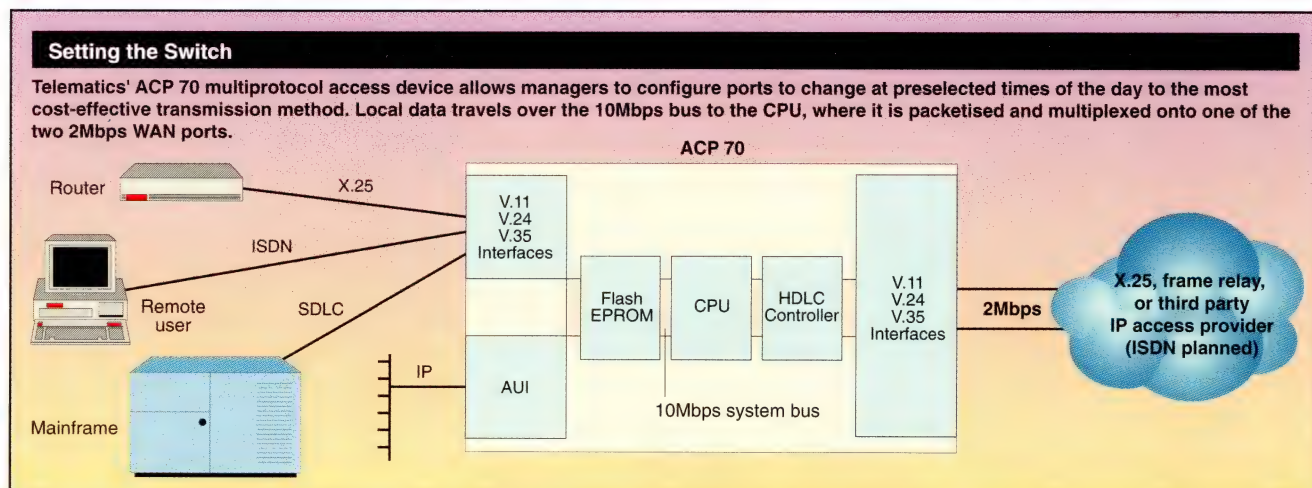
**Distributor:** Datacraft Australia Pty Ltd, PO Box 353 Croydon VIC 3136  
Tel: (03) 727 9111

same link. Data coming in from the Ethernet or the local 64Kbps ports is transferred over the 10Mbps system bus to the CPU, where it is packetised and multiplexed onto one of the 2Mbps ports for transmission over the WAN (see the figure).

Because several functions put demands on the CPU's processing power, the ACP 70's performance may not be up to par with similar devices that have a distributed architecture with processing power dedicated to each connection. Telematics claims the ACP 70 can process 700 packets per second and about 800 frames per second. But by designing the product around a centralised processor the vendor can sell the product at a relatively low price: \$8,400.

The ACP 70 handles SNA's special needs by performing LU and PU spoofing, which keeps sessions alive and also prevents a barrage of polling broadcasts from flooding the WAN.

**Kieran Taylor**





# ANNOUNCING THE END OF ATM.

Some companies are making a big deal about ATM (Asynchronous Transfer Mode). And about technology. But it will take more than just ATM to deliver networking solutions. It takes a portfolio of broadband products and technologies, a thorough understanding of multimedia applications and an architecture to pull it all together.

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**John Riedl**

*Executive Chairman, Jtec Pty Ltd*

John Riedl is the Executive Chairman of Jtec Pty Ltd, Australia's leading designer and manufacturer of equipment for the Integrated Services Digital Network (ISDN). He is also Chief Executive of Techniche Ltd, the investment holding company which owns 76.8% of Jtec. Before joining Techniche in 1986, Riedl was General Manager of the Information and Control Division of AWA Ltd. He has a Bachelor of Science and Bachelor of Electrical Engineering (Hons) from the University of Sydney. Liz Fell spoke with him last month at Jtec's Sydney headquarters at Meadowbank.

**J**tec's parent, Techniche, is one of the few companies licensed under the Government's Management and Investment Company [MIC] programme that has succeeded. Were there problems with the scheme?

**Riedl:** Yes. The MIC scheme was flawed for several reasons, one being that there was not enough money. There is an entry price for high technology. Think of Qantas which started 60 or 70 years ago with a dirt strip, a plane, a drum of petrol and one pilot. To start an international airline today is probably a several billion touch. Electronics is similar. The MIC programme basically worked on a \$1 million start-up per venture when you actually needed more like \$15 million or \$20 million. In my view only two of about 11 high technology companies approved by the MIC licensing board have succeeded: Techniche and Hambro Grantham or First MIC. Others may have a different view of course.

**AC:** Has the Government's policy towards start-up high tech companies improved since the MIC program?

# Jtec — Developing Australian High Technology

**Riedl:** No. It's a lot worse for several reasons. The first is that the start-up cost of high technology has gone up. The second is that Telecom, which was really an engine of development, is under such competitive pressure that it is likely that it will buy less and less from Australian companies.

**AC:** Has Jtec's strong relationship with Telstra been a major factor in the company's success?

**Riedl:** Absolutely. I met up with Telecom when I was with AWA. When I was hired as Chief Executive of Techniche I decided that the MIC model that everyone in the industry was pursuing wasn't going to work and that we had to do things differently. I also got sick of signing references for my old engineering team who were leaving AWA, so I said: 'If you're going to leave, let's form a venture.' We formed Jtec, which was very unusual in an MIC scheme because rather than having a group of inventors with an idea coming in the door, we did it backwards. We went to see Mel Ward and said: 'We've got some money, we've got some competent engineers who have worked internationally, but we want something to do. Any ideas?' Telecom suggested ISDN. We spent six months researching it and here we are today.

**AC:** Did you leave AWA when Christopher Skase was trying to move in on the company?

**Riedl:** Yes. Christopher Skase was trying to get into AWA at the time, but I left for other reasons. Fundamentally, I had been there for nine years. As we know, AWA has since declined in revenues. I noticed last week that Jtec's market capitalisation was now actually higher than AWA's.

**AC:** It's sad that AWA fell on hard times because then it was really the only Australian-owned company among the multinationals.

**Riedl:** It was the only sizeable company among the large multinationals. Yes. It's a national tragedy. Australian high tech companies come basically in two sizes: small or large with nothing in between. The small companies usually make one product for one market set, or they screw things together in the backyard and eke out a living. That's the typical Australian company. Interestingly, in

the history of high tech, Nucleus and AWA are the only two Australian companies that have grown to international size. Now we have Stanilite and perhaps ERG. That means there are four Australian-owned high tech companies in our history that have either looked like getting there or have actually got there. Jtec will be there soon too.

Everyone forgets that Australia is a very advanced technology user and a very fringe technology producer. There is a vast distinction between the two. If Napoleon described the British as a nation of shopkeepers then we really need to describe ourselves as a nation of salesmen for overseas multinationals and tax collectors.

**AC:** How is Jtec placed at present on the list of Australian companies that have made it to an international size?

**Riedl:** We have revenues of \$27 million a year so we're not there yet! We need to be at \$100 million to be internationally viable.

**AC:** Returning to your partnership with Telstra, hasn't it supported Jtec in areas like R&D, sales and marketing over the years?

**Riedl:** Telecom funded a very small part of our R&D, worth about \$100,000, at an early stage and they developed our multiplexer which cost about \$3 million. Telecom worked with us, rolled out the network, rolled out the multiplexer as part of the network, and became the exclusive agent for a couple of years.

**AC:** Was that a Telecom condition for funding the R&D?

**Riedl:** Yes. Subsequently we put our own sales force in the field in parallel with Telecom and sold jointly. Then we went into Telecom's EDC [Enhanced Distributor Channels] programme and we've been a very successful member of that. Telecom gave us another \$3 million R&D contract in 1990 for extensions on ISDN. We've now paid back the majority of that in royalty. Certainly, they'll get all of that back by the time it is over. In addition, Telecom have generated a large increase in the Australian ISDN system.

**AC:** And that was because Jtec's ISDN multiplexers were available to network users?



**Riedl:** Yes. Telecom has had in excess of one hundred million dollars of ISDN network revenue as a result.

**AC:** *So they have done well out of their investment?*

**Riedl:** They've done extremely well. That's appropriate for a partnership.

**AC:** *Was it important that Telecom led the world in the commercial implementation of ISDN?*

**Riedl:** Yes. If you're going to do high technology from Australia, it's a bit like the old Irish joke: 'How do you get to Tipperary? Well, you wouldn't want to be starting from here.' From Australia, we've got to be the best in technology, and the only way to be the best is to be first. We had one very simple secret at Jtec. We started about two years before the rest of the world and we threw a lot of money into R&D. I think that the two things that have worked in Jtec's favour are getting the best technology and getting the right alliances.

**AC:** *When you enter a market early, as Jtec did with Narrowband ISDN, does the lack of a world standard add to the costs?*

**Riedl:** Yes. Indeed, the differences around the world cost a lot. They can't even standardise a power plug around the world!

**AC:** *How important is Jtec's alliance with BT?*

**Riedl:** We have two arrangements. One is the very important contract to supply a network to BT for the NSW Government which is worth about \$14 million so far. That contract opened the door to BT in the UK where we tendered against open worldwide competition and were judged world's best value and world's best price. The operational people in BT UK thought the NSW Government contract was great, but they wanted quality of product and assurance of delivery because they're on the other side of the world and they've got to get the product to work for their customers. They chose us because we're the best, and because we have the largest installed base. They're selling our equipment now. We got an order today from the Clydesdale Bank.

**AC:** *Does Jtec have problems convincing potential offshore customers that it has the capability to deliver?*

**Riedl:** It's a problem for every Australian company to convince anyone elsewhere in the world that we actually have technology. They think we have kangaroos in the street!

**AC:** *So how do you convince them?*

**Riedl:** Through our alliances, our proven track record, our installed base, the equipment that we submit for test and how we respond. The NSW Government purchasing policy gave us a reference site and opened

the door to BT in the UK, but getting through the door was different. We had to do that on our own merits.

**AC:** *Did that require spending a lot of time in the UK?*

**Riedl:** Yes. We sent people across there and we've had offices there for two years now. We also have an R&D centre in Ireland to do the localisation and homologation of the equipment. But the major R&D is done in Sydney and now in Perth as well.

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*"Some people would have it that we exported high tech worth \$1 billion in recent times. That's fine. But what about the \$900 million worth of bits that came in? I'd like to see some real numbers on Australian content. It's ludicrous that some of these companies wanting to put in cable systems actually offer as Australian content that they're going to dig up the road."*

---

**AC:** *Jtec claims to have the largest installed base of ISDN multiplexers in the world. Is that bolstered by the supply arrangement with BT in the UK?*

**Riedl:** That's in Australia alone. I think we have got in excess of 90% of the ISDN Primary Rate multiplexer area in Australia. You can see our success from these graphs: increasing revenues, R&D expenditure and profits. We are averaging about 80% per annum compound for the six years.

**AC:** *There are no dividends at this stage?*

**Riedl:** No. Dividends won't be paid until we get to an internationally sized critical mass.

**AC:** *Clearly Jtec's alliances with carriers such as Telstra and BT are important. What is your alliance with AT&T?*

**Riedl:** We have two agreements with AT&T. One is with AT&T Paradyne for ADSL which we are still working on. That's a component issue. There is a broader agreement with AT&T Network Systems where we've been working together on the superhighway.

**AC:** *Telstra has announced contracts with both NEC and Jtec for the ADSL pilot. How do the contracts differ?*

**Riedl:** NEC is trialling the fixed data link service with the two alternative delivery technologies: DMT [Discrete Multitone] which AWA is providing and CAP [Carrierless Amplitude Phase]. We have a contract to provide a completely separate trial with ATM [Asynchronous Transfer Mode] and a choice of the two delivery technologies at the end.

**AC:** *And the CAP transceivers are based on AT&T chipsets?*

**Riedl:** Yes. AT&T is the licensor of the CAP technology. The problem is that ADSL is still terribly new. DMT appears to be slightly technically better, and certainly has been approved by the standards bodies, but it is by no means ready for market.

**AC:** *The DMT costings that I've seen are very high.*

**Riedl:** The reason is that instead of a single chip, it needs a 14-layer board with 16 processors on it. That won't change for two or three years. So DMT is by no means deployable but CAP is deployable. Telecom will primarily make the choice of which technology they will implement.

**AC:** *Does Jtec see opportunities in the consumer end of the business such as set-top boxes?*

**Riedl:** Well, as part of the Telecom ATM ADSL trial, we will need to make the front-end to the set-top box. If we're bringing the signals across the ADSL link, they must be terminated in something.

**AC:** *Could you be interested in making set-tops too?*

**Riedl:** We're not interested in making conventional set-top boxes. There is no point in doing that because all that stuff is being imported. It's a technology that has been around since the 1950s. But if there is a new generation of set-top box required, then we would look at it.

**AC:** *Did the broader agreement with AT&T involve a bid for Telecom's cable contract?*

**Riedl:** Yes. We jointly bid with AT&T.

**AC:** *And you missed out on that?*

**Riedl:** Well, the cable contract is in a number of phases. What's being implemented now is basically 1950s technology brought up to date: standard vanilla American cable TV.

**AC:** *That, of course, will not deliver the video-on-demand services that viewers appear to prefer. Telecom will only be able to deliver near video-on-demand.*

**Riedl:** Perhaps not even that!

**AC:** *Because there may not be enough channels available?*

**Riedl:** Yes. There are only about 67 channels. But we weren't interested in that part of the business anyway. Neither Jtec nor AT&T actually manufactures those components. We were interested in the digital phase and that hasn't been let by Telecom yet.

**AC:** *So what did you say in your expression of interest or your tender?*

**Riedl:** There were some expressions of interest and there were tenders. But what Telecom is implementing now is only the first



phase. We're interested in the subsequent phases.

**AC:** *What timeframe are you envisaging here?*

**Riedl:** The way I see the information highway going is that it first starts with conventional CATV technology, analogue modulated and analogue encoded. The next phase will be digital technology, the digitisation of the network. That will be digitally encoded and analogue modulated and will go from 67 channels to about 670 channels on the same fibre-coax. The next phase will be integrated video and telephony on the fibre-coax, and in parallel you'll see ADSL on the perimeter in the outer suburban areas. The last phase will be interactive, and at that stage you may well see ATM to the home. That could be about 1997-1998.

**AC:** *That's very fast!*

**Riedl:** We're at a cusp in technology. Things are changing very fast. The ATM technology is only just becoming available worldwide, so it's really much more of a cost issue. There are lots of advantages in taking ATM to the home, but the costs have to come down. That will happen. The world is basically moving towards putting ATM down the cable.

**AC:** *When do you expect Telstra to announce the next phase of its cable system? Sooner rather than later?*

**Riedl:** Sooner.

**AC:** *Is that because Optus is planning to move into the same area?*

**Riedl:** Yes. But I think it is also because the technology is developing.

**AC:** *Would you bid on the Optus cable contract?*

**Riedl:** I suppose we'd bid on any business.

**AC:** *How does Jtec's agreement to buy ATM chipsets, hardware and software from Telstra's QPSX Communications strengthen its position in cell switched technology?*

**Riedl:** Well, Jtec has its own ATM technology. We've been working on it for several years and we've had an R&D project for some time.

**AC:** *Has Jtec's ATM R&D moved into the prototype stage?*

**Riedl:** It's at the chipset level. However, clearly QPSX has developed advanced technology. This technology is in basically two streams: one for the carrier market and the other for the commercial market. The technology for the carrier market has been licensed to Siemens and Alcatel who are selling that around the world and QPSX are selling that to Telecom in Australia. The commercial technology hasn't yet been released, and we're taking over that side of the business. We now have a major office in Perth doing

ATM R&D that will integrate with our ATM R&D in Sydney. We've taken over more than 20 people and a floor of the QPSX building in Perth. We've got more than 85 people working in R&D now.

**AC:** *And Datacraft has another agreement with Telstra to use the ATM switching work by the former OTC to incorporate an ATM interface in an Open Router product?*

**Riedl:** Yes. I believe that was done some time ago.



*"If Napoleon described the British as a nation of shopkeepers then we really need to describe ourselves as a nation of salesmen for overseas multinationals and tax collectors."*

**AC:** *How do you separate the QPSX carrier market from Jtec's corporate market?*

**Riedl:** The platform that we have purchased from QPSX is not designed for carrier applications. That doesn't mean that Jtec can't go into carrier applications. There's nothing to stop that. It's just that the QPSX technology is designed for the commercial marketplace, and that's where it will be used initially. Who knows where it will be used in future? We're supplying a network to BT for the NSW Government which is designed to have 155,000 people on the network. We could certainly put ATM on to that.

**AC:** *You have said that this is the first of Jtec's contracts with QPSX.*

**Riedl:** Yes. We plan to do other things with QPSX in the future.

**AC:** *What sort of things?*

**Riedl:** I think we will just respond to market needs as they emerge.

**AC:** *Do you expect QPSX to stay under Telecom ownership?*

**Riedl:** Yes. Telecom has announced that publicly. QPSX was for sale and Telecom decided not to sell.

**AC:** *Couldn't the QPSX opportunity change if Telstra were privatised?*

**Riedl:** Yes. But that won't happen quickly.

**AC:** *So what is your strategy to move from Narrowband ISDN to Broadband ATM-based ISDN?*

**Riedl:** Well, we're very strong on voice and most people in this business are strong on data. It's the integration of voice and data that makes the difference. What the QPSX agreement means is that we can offer better connectivity and cheaper bandwidth-on-demand to both Australian and international businesses. We're no longer just a Narrowband ISDN house. We want to provide our commercial customers with a ubiquitous socket on the wall. And we want to provide the carriers with a ubiquitous socket as well so they can plug in whichever network suits the customer whether it's based on DDN [Digital Data Network] or ISDN or ATM technology. That's our family of products. We can now offer the whole gamut of past, present and future technologies. Separately, we also provide applications and some terminal equipment.

**AC:** *Won't it be difficult for Jtec to be first in the race to achieve Broadband ISDN?*

**Riedl:** We can't be first across the board, but we can be first in some niche. I think the combination of Jtec's native technology and the QPSX technology that we have bought will be a unique offering. I think we will be first with that combination.

**AC:** *Do you see ATM as shifting the balance of power away from the carriers to customers and customer network vendors like Jtec?*

**Riedl:** That's a regulatory issue because the carriers could dominate worldwide just because of their muscle. Every time the carriers bring out a service, people like us who are smaller and nimbler can bring out an optimisation of that service. It's the same whether it's DDN and we put on some muxes and do bandwidth management; or whether it's ISDN and we use voice and data integration; or whether it's ATM and we bring on new services. We can do that a bit better than the carriers and therefore offer better results to our customers who are the top 600 companies in Australia. But ATM will take off not because it's a political issue but because it's technically better.

**AC:** *So Jtec's strategy is to nip into the commercial ATM market before the carriers?*

**Riedl:** I hope so. We can also interface with Telstra's ATM because it comes from the same stable, doesn't it?



**AC:** Yes. Thanks to QPSX. But where does that leave the carriers? Will they just become mere distributors of cells or commodity bit carriers?

**Riedl:** They're facing that problem worldwide. That's the argument about whether Telecom should get into the content of the superhighway rather than the bits of it. But when we put in a private network, we're basically competing with the carriers but we're also doing it with the assistance of the carriers. It's all part of getting better service to customers who may want voice compression or eight calls down one line if they can get it. The reason the carriers go along with this is that the overall traffic volume grows. With Narrowband ISDN, perhaps about half of the traffic is services that have come from DDN or voice and have been put onto ISDN at a lower cost. But the other half of the traffic is new services that weren't done before like videoconferencing.

**AC:** Narrowband ISDN took a long time to take off didn't it?

**Riedl:** It's progressive. It's certainly happening now.

**AC:** Where do you see Optus as moving in the future?

**Riedl:** The issue is quite a simple one. At the moment, a customer can buy 64Kbps for basically one dollar a minute for voice and data and ISDN. In a couple of years, Telecom and others will be delivering 6Mbps for a dollar for every four hours or something like that. That is three orders of magnitude change in cost. This, of course, is Optus' problem because it doesn't have the same customer connections. The main commodity that Optus is selling — long-distance bandwidth — is rapidly decreasing in value and cost as well. That is why Optus is showing interest in the market. And that is why both Optus and Telecom must go ahead with this, whether they want to or not. They've got nowhere else to go as carriers.

**AC:** Nowhere else to go?

**Riedl:** Except out of business! Think about the history. The thing that was expensive in the first place was the customer access network. Then long-distance got expensive, but the cost has fallen astronomically. The price hasn't, but the cost of long-distance networks has. Now what you're seeing is the cost falling again very rapidly. So the real value of the network is going to be in the customer access. Optus has set up as a long-distance carrier and they are seeing the cost of long-distance bandwidth come down substantially. So I believe that Optus has to get into the customer access network.

**AC:** Is ATM beginning to take off in LANs?

**Riedl:** I don't think there is much going into LANs as yet. Most of it is fixed bandwidth. ATM is initially being used for professional

applications in the office — people with big Unix workstations who have huge peak loads. But ATM will eventually boom in LANs and, depending on which way the cost factors go, we may find ATM to the home next. The cost may drive down so fast that the residential market will actually happen earlier. It may not be very different from the office. ATM inherently has addressability. You can address two set-top boxes, the PC, the telephone, the burglar alarm and the microwave. When you start to put the home on a LAN — the home LAN — then ATM makes sense to the home. I think we'll see the equivalent of the home LAN.

*“... ATM will eventually boom in LANs and, depending on which way the cost factors go, we may find ATM to the home next. The cost may drive down so fast that the residential market will actually happen earlier.”*

**AC:** Returning to your interest in Federal Government support for Australian-owned companies, what do you see as the solution?

**Riedl:** I'd like the Government to do three things. First, I'd like to see them use real numbers. The statistics at the moment are misleading, to put it kindly. I'd like to see the Australian Bureau of Statistics collect information not just on exports but also on the import cost of those exports so that added value is measured. Some people would have it that we exported high tech worth \$1 billion in recent times. That's fine. But what about the \$900 million worth of bits that came in? I'd like to see some real numbers on Australian content. It's ludicrous that some of these companies wanting to put in cable systems actually offer as Australian content that they're going to dig up the road. Where else are they going to dig up roads if they're here in Australia? Buying Holden cars, digging holes in the road, assembling things under licence, and designing and building Australian products are different. So we need the real numbers.

The second thing is some affirmative action to support Australian-owned companies as distinct from multinationals operating in Australia because in the end their profits get repatriated back home. The Industry Minister, Peter Cook, actually announced that this Australian company, Philips, got the cable contract from Telecom! Philips is, of course, a Dutch company. I've got nothing against multinationals. They are important for the economy. However, we don't have a Philips or a Nokia or an NEC or a Fujitsu or an AT&T. Considering this is a Government that is committed to minority groups, it

would be nice if they recognised this minority group called Australian-owned high technology companies and then did something for them like affirmative action.

**AC:** Could that be done under the GATT?

**Riedl:** Every other country in the world does! The third issue is 'Buy Australian.' The Government only talks about this: they seldom do it. Jtec actually wins a lot of good Government business, so I'm not complaining for Jtec. But Australian Governments in general buy little high technology from Australian companies, and purchasing power creates companies. Telecom in its history has created probably twenty \$100 million companies: Philips Australia, Fujitsu Australia, Alcatel Australia and so on. Why can't Telecom create an Australian multinational? All they have to do is buy from them. America actually has a Buy America Act.

**AC:** Pouring funds into R&D is another key Jtec strategy. In a submission to the Industry Commission, you suggest that public funding for the CSIRO be diverted to industry.

**Riedl:** I'd like to disband half of the CSIRO. There are a number of activities of national importance such as agriculture, fisheries, nuclear physics and pest control that the CSIRO should do. But it should not be doing what industry does better. By any measure, the return on the \$600 million that goes into the CSIRO each year is atrocious. I think the funding that is commercially related should be spent on industry because the CSIRO rarely commercialises anything.

**AC:** How can the intellectual property be kept in Australia?

**Riedl:** One way to make sure the intellectual property goes overseas is to give contracts to multinationals to develop it here. That guarantees it goes overseas! With an Australian-owned company, there's at least a fair chance of it staying here. Screwing together a foreign-designed piece of equipment isn't really the sort of intellectual property that is going to be re-used.

**AC:** How do you keep companies under Australian-ownership?

**Riedl:** There is a mechanism. It's called the FIRB [Foreign Investment Review Board].

**AC:** It's hard to know how the FIRB actually operates, but many would argue that it is completely ineffective.

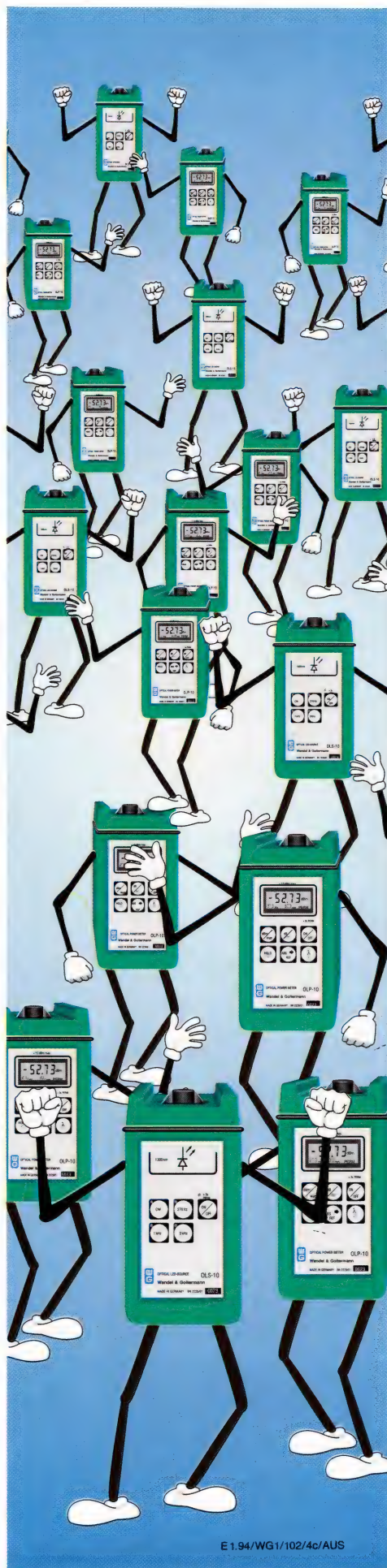
**Riedl:** The mechanism is there. But it's not implemented any more than getting real statistics or any of the policies the Government has talked about for the last 30 to 40 years have really been implemented. Government policy for Australian industry is failed policy.

*Liz Fell is a freelance journalist based in Paddington (NSW).*





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# Beyond the Future: Multimedia and the Law

Legal scare stories abound, but Peter Leonard undermines his business by suggesting that you might not need to be Perry Mason to deal in multimedia.

We are in a period of legal uncertainty, before changes to the law affecting multimedia become generally accepted as necessary. In the meantime, we apply old law which is inappropriate, often uncertain and sometimes just plain silly. That said, people dealing with multimedia can find a navigable road past the legal signposts and warning signs.

True, the road is still a bullock track in parts. Resurfacing and better signposts are required. Until the road gets better, many rights owners will continue to be wary of consigning their valuable property to pioneer bullock drivers — that is, multimedia producers. For the moment, all lawyers can do is tinker with minor road works and caution you to drive carefully. In the next three to five years the legislators will need to build a whole new road — that is, create a new copyright paradigm — or the current system will become an impassable bog.

This month we look at the difficulties faced by multimedia creators in developing product. Next month's *Legal Line* will review the adequacy of copyright protection of the finished multimedia product.

## Rights Clearance — Is Multimedia Different?

One common theme through most legal reviews of multimedia is the need to get right getting the right rights.

Does multimedia really create novel problems of clearance of rights? After all, film makers routinely clear rights to bundle pre-recorded music, pre-existing and new cine footage, photographic stills, computer generated images and artistic works, and adapt literary works in order to create cinematograph films. Film makers have found their way through the rights clearance minefield with only a few casualties along the way. Some war stories: lawyers for Paramount fell out with Philips last year over the extent of rights granted to Philips to put films on video CD. Paramount initially claimed that a licence it had granted was limited to one video format, then eventually conceded that the licence had a wider application. Or a less happy outcome: in the early 1950s Disney Studios hired Peggy Lee to sing in *The Lady and the Tramp*, for which she was paid \$US3,200. When some forty years later Disney released the video version Peggy Lee sued, claiming Disney did not own the

video rights to her voice and song. The judge agreed, and Lee won over \$US3.2 million in damages for copyright infringement.

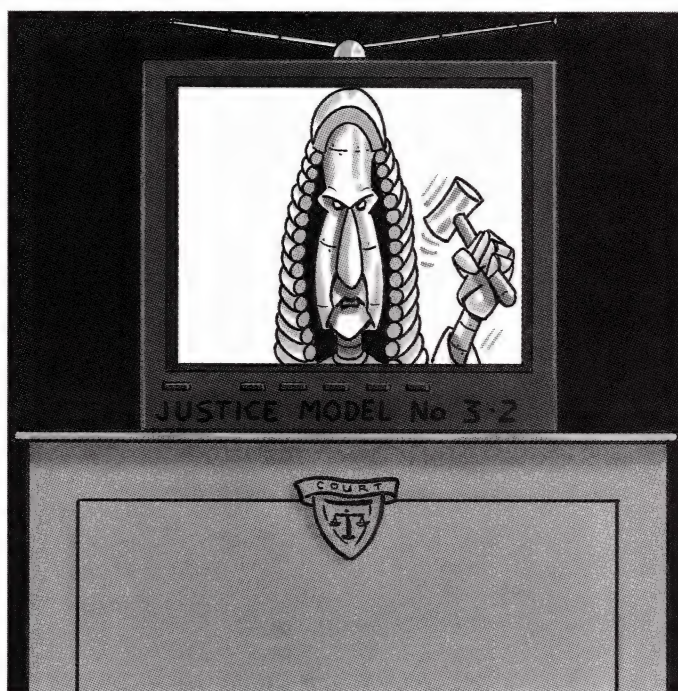
However, there are important points of difference. Multimedia production involves negotiation of rights which are generally not relevant for film production. The underlying product is itself protected: the multimedia engine is a computer program protected by copyright. Generally, reproduction and sale of the multimedia work requires a runtime licence from the owner of copyright in the multimedia engine. However, no great drama here: usually runtime licences are available for a per copy charge, and sometimes for a flat fee regardless of the number of copies.

A multimedia work will often include use of a printed book. This may involve at least two distinct copyrights: one in the book's text and another in its typographical layout. (There may well be additional relevant copyrights, if photographs and illustrations are involved.) And this is, of course, where multimedia as a product starts to significantly diverge from cinematograph film. These points of divergence can all be traced to three unique aspects of multimedia.

First, a wider diversity of inputs is possible than for other copyright product: inputs may include literary, dramatic, musical and artistic works, sound recordings, cinematograph films, television and sound broadcast, published editions of a work and protected performances. There are, quite simply, usually more rights in play, and therefore more clearances to obtain.

Second, multimedia is non-linear in use. Different people use different bits of a product. This makes it doubly hard to figure out which bits are worth how much.

Third, digitalisation means that multimedia product is both more useable and more reusable than most other copyright products. Digital morphing possibilities lead to complex issues as to the scope of the grant of copyright permission and as to moral rights. If I am the author of a scholarly work on Islam, I may object to reproduction of part of my text in a multimedia product against a background of film footage of rioting fundamentalists. Further, reproducibility of digital product facilitates use of multimedia product in a way which is quite different to film. For films, the primary form of recouping investment remains cinema exhibition, television broad-





cast or sale of copies for video rental. Sales to the public are of limited significance, because there is limited demand — other than from *Blues Brothers* aficionados — to watch the same film over and over again. And, of course, rental videos degrade with use, meaning rental stock must be turned over, and degrade with reproduction, meaning that (effective enforcement aside) commercial rehiring of pirated videos is uncommon.

Multimedia is easily reproduced any number of times and frequently used for high reuse applications, such as an encyclopedia or a video game. Nintendo games are now commonly (and illegally) posted to bulletin boards for anyone to download. So although multimedia product is in many ways like film product, the likelihood of illegal reproduction and use is substantially greater.

Turning back to rights clearances, these three aspects of multimedia create particular problems. Rights agreements are usually negotiated in relation to a specified and known use in a specific product of an identifiable piece of property. Synchronisation and dubbing licences, for example, relate to quantifiable use of a particular piece of music in a particular film. The value of those rights can be estimated by reference to industry norms and the extent of proposed use of the music in the film. Although a large number of copyright permissions must be negotiated, the separate uses can generally be readily identified, and the value of rights quantified.

By contrast, multimedia and on-line interactive services are non-linear. Different users accessing different parts of the product. In many cases the multimedia producer will itself be unable to specify the extent of likely use of the copyright owner's product when the licence is initially sought. Many multimedia programs are compilation works, which are not produced to a tight script or to precise design specifications. The multimedia producer at the time of negotiation may simply not know how significant a particular item may ultimately be to the overall package.

Because multimedia is interactive, the multimedia producer may not be able to predict, or meter, the extent of use of different parts of the multimedia product, and so propose an equitable apportionment of rights fees between copyright owners. For example, the Microsoft encyclopedia, Encarta, contains 15,000 multimedia elements (sound, video or animation). Moreover, most multimedia products market for less than \$150. In a still limited consumer market, there is an obvious limit on what a producer can pay by way of royalties for all items, let alone each item.

Given rapid growth in the multimedia sector, it is also difficult to assess the size of the likely market. The installed base of multimedia-capable platforms in the United States was about seven million in 1993, and is expected to reach nearly 22 million by 1995. It remains to be seen whether that installed hardware base is extensively used for educational and business multimedia, rather than the more price constrained consumer market. Current (1994) estimates size the United States markets as \$US319 million consumer, \$US55 million educational and \$US20 million business.

Often so called rights owners will not have the rights they think they have. One example: when Eastman Kodak wanted a library of photographs to sell on CD-ROM, the company bought up the largest stock photograph house in the industry which had six million images. As it turned out, when Kodak's lawyers looked at the photographers' release forms, they found the stock agency didn't own the magnet-optical rights to images and as a result Kodak had to renegotiate distribution rights with each photographer.

We often find that rights in relation to cinematograph films are defined in now obsolete terms — for example, 'cable rights' — which may not encompass new forms of distribution, such as narrowcast microwave MDS delivery. Many 'old' copyrights do not anticipate cable, or even video, let alone multimedia. In short, there is no doubt that clearing multimedia material is more difficult than clearing other copyright products.

The Copyright Convergence Group (CCG) rejected the suggestion that development of the multimedia industry requires establishment of special licensing schemes, to ensure that multimedia

producers are able to access necessary copyright works for inclusion in their products. The CCG noted that such schemes have not been considered appropriate for other industries such as film, and that international developments are moving away from non-voluntary licensing of copyright works.

Clearance difficulties should become less over the next few years, as copyright owners become more familiar with the multimedia industry, and as drafters of underlying copyright licences anticipate possible multimedia use. In the meantime, such difficulty as undeniably exists is not sufficient cause to advocate compulsory licensing. There will be casualties along the way — the rights owners who charge too little, and the licenses who paid too much. This is unfortunate, but part of business life.

## Moral Rights

As we have already noted, digitisation allows copyright material to be more malleable than ever before. What if the author doesn't like what the multimedia producer does? To date, because we have not had moral rights protection in Australia, authors and performers have had very limited protection. The Government's June 1994 Moral Rights discussion paper proposes a new right of integrity. This is the right of an author to object to distortions and mutilations, modifications or derogatory action in relation to their work, that prejudicially and unreasonably affect their honour or reputation. Examples include use of a work in association with a product, service or cause that would offend against the known views of the author; deletion of substantial part of a work to alter its contexts or intended meaning; or alteration to an original artistic work.

The Government proposes that moral rights extend to authors of literary or dramatic works, artists, composers, producers or directors of films and videos, and possibly also to performers. It is not currently proposed to extend moral rights protection to producers of sound recordings, sound and television broadcasts, or to published editions of works, or to authors of computer programs.

Moral rights may be waived, but the waiver must be in writing signed by the person entitled to the rights and, of course, must in its terms extend to the conduct concerned. (Many holders of moral rights will seek to limit a waiver to a specific and known use, rather than leaving themselves open to the possibilities of digital morphing.) And, of course, people will continue to be entitled to the protection afforded by the law of defamation.

The CCG discussion paper uses the current division of copyright works. Where does a multimedia product fall within those categories? In other words, which bit of your product has what moral rights protection, and who has the benefit of that protection? When a multimedia producer uses bits and pieces from other works which are themselves subject to protection, how do you identify who has the rights in those bits? In the case of film particularly, it may be hard to identify whether the rights are with the producer or director.

Next, how do you determine whether moral rights are violated? Is a proposed use 'derogatory'? The Government's discussion paper proposes continuation of a current copyright permission for use of a work for 'parody or burlesque' and notes that 'parody' is associated 'with ridicule and is generally directed at criticism of a work of an author.' The boundary line between a 'satire, spoof or the lampooning of a work or film' and use in a manner which offends the honour or reputation of the moral rights holder will often be difficult to draw.

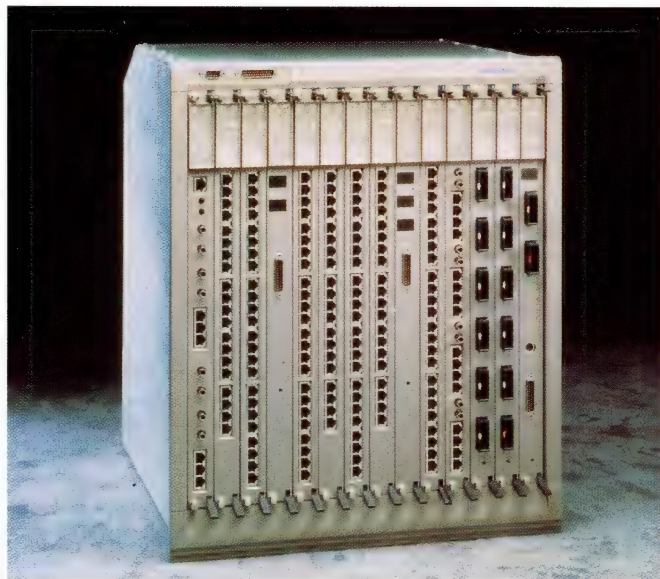
Moral rights and privacy protection will, over the next decade, come to be major new areas of law and legal dispute. The law in this area will fundamentally change how copyright creators do business, just as anti-discrimination law has changed the face of industrial relations. Multimedia producers are likely to be on the frontline of forthcoming moral rights skirmishes.

*Peter Leonard is a partner at Gilbert & Tobin, technology lawyers, and specialises in technology and telecommunications. This column sets out his personal views.*



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Tom Amos

## Resellers — A Class Apart?

**R**esale — the bulk supply of telecommunications capacity by carriers to all who wished to add value and pass on to the less fortunate — was one plank upon which those who framed the *Telecommunications Act* intended to build a brave new (partially) deregulated world. Unfortunately, the definitions of basic and other services open to competition were not clearly set at the outset and the industry drifted following the old bulk aggregation and single service resale model. Three years later, these simple aggregation strategies are looking less than ideal from all sides. Resale is still seen as an important component of the competitive process but should resellers be enshrined as part of the trickle down duopoly? Some believe this is so but such beliefs do not accord with the concept of a competitive market.

If you consider the current marketplace there are in fact three tiers of service provision: primary service provision via the General Licence carriers (which have a basic infrastructure duopoly); secondary supply via resellers and the carriers; and tertiary supply via the retail market and associated market channels. The basic infrastructure suppliers do provide capacity and services at all levels of the user supply equation and thus either directly or indirectly control both the margins and price that can be charged for a product in all tiers.

In this market, the duopoly carriers are supposed to supply services to all who require them. The dominant carrier must offer basic services and the same prices to everyone whilst the non-dominant carrier has the option of packaging services as it sees fit. The reseller deals with all suppliers and sells to those who can derive some benefit from purchasing the services presented in such a way . . . or so the theory goes. Of course the non-dominant carrier can offer whatever prices it desires and the resellers must live on the margin between bulk purchase of capacity and the price that the non-dominant carrier sets in the retail marketplace for the same or similar products.

Safeguards in such a market are very few. Right now, the carriers are allowed to compete at all levels of market with little effective check and balance as to cross-subsidisation and market price. Telecom's withdrawal of special aggregation discounts and replacement with product-specific arrangements on a volume basis has not helped the low value-added reseller who must operate on just the aggregation margin. The carriers have also commenced reseller capture campaigns and market channel arrangements in the retail area that all increase the pressure in the middle marketplace.

For the resellers, adding value and applying technology to bandwidth is the key to their margin. But continuous changes in the telecommunications marketplace mean that the need for resellers to become more innovative is greater than ever. At the retail end all the carriers have developed scores of market channels to package particular products into the retail area in addition to their traditional marketing and sales arrangements. It is the latter area that the middle group of resellers and repackagers feel that they are squeezed.

Their response to the squeeze has been a plea to Austel to have declared a new distinct class of person that may enjoy special discounts that are not available to any other group. This special class of person would be able to purchase at product rates that were not available to large users who actually may have more traffic than the special person but cannot gain the advantage for such traffic. The concept really boils down to a distorted marketplace that neither reflects the costs or the true prices of services if such a person were created. The benefits of change would in fact reside with the carriers and the resellers and the chances of then being fully distributed to the users would seem remote indeed.

What is wrong with competition? If an active market is to be maintained then it should be encouraged — but at what cost? It would be indeed strange today to subject an opening market to special protection arrangements that may distort the future opportunities for users to benefit from competitive pressure. The Government has already decided that in 1997 the market will open even further, so closing a section today would be inconsistent to say the least.

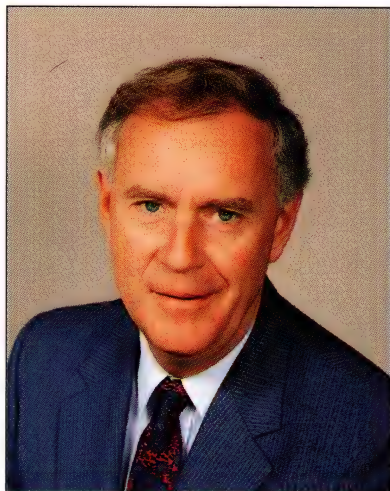
For resellers, perhaps its prudent to ask if there is a viable long-term marketplace for their operations without eventually installing their own infrastructure to capture the primary cost structure at its source. One of the underlying difficulties when the Act was written in 1991 was ensuring that Telecom was not exposed to full competition without time to adjust to cost-based pricing. But there has been for some time an industry view that cost-related pricing is a goal that will be achieved only in a truly competitive market. Without cost-related prices it is difficult to see the post-1997 regime introducing competition on provision of infrastructure.

The battle of the reseller for tied marketing is far from over and it is possible to conclude that prices are now being set that do not reflect cost but market strategies for market share. As the war rages the middle margin erodes and Darwinian reseller natural selection is quite likely. First on the block will be those classes that do not add much value, the switch-less reseller who buys in bulk and then resells in less aggregated forms. The squeeze is on . . . and the more value that is added the less the pressure on the rate. Unlocking the dominant carrier could ease some of the concerns but history says the minimisation of leakage generally takes precedence over most other activities.

In the carrier-led crush to establish a clear marketing arrangement prior to any further changes of marketplace in 1997 the switch-less resellers, the early pioneers of price reduction, may be the first casualty. Natural selection or studied genocide? It's difficult to say without a clear separation of wholesale and retail carrier activities, but in a transitional marketplace the historic trend favours contemplation.

*Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.*





*Bill Melody*

# Convergence in Telecommunications Policy Development

**T**he Issues Paper, *Australian Telecommunications Policy and Regulation — Beyond the Duopoly*, for Minister Lee's review of post-1997 telecommunications policy provides a considered overview of issues relating to the traditional telecommunications industry — the carrier network. But on the linkages backward (equipment, software, intellectual property and R&D) and forward (applications in other sectors of the economy), it is weak or silent. Thus it runs the risk of doing a good job of fashioning a policy for the pre-1997 industry, but an obsolete job for developing an effective post-1997 policy.

People are now pretty comfortable with the issues of technological convergence, initially between computing and telecommunications, and more recently between content and carriage — through the Internet, multimedia, intelligent networking and related developments. More recently, industry convergence has dramatised the economic, financial and market implications of these developments. Cross-industry strategic alliances and joint ventures such as the Telecom-News-Nine Network initiative illustrate the potential benefits and problems of economic convergence — including a serious concern about monopoly power in an information society.

Clearly post-1997 policy must systematically encompass all the technologies and industry sectors that are converging. It must encompass the entire value chain from R&D to equipment, software, network development, VAS and the conditions for applications in other sectors. Telecommunications is no longer a separable industry for policy development. It is rapidly becoming the electronic infrastructure for the whole economy.

The key to the next phase of microeconomic reform will be effective applications of electronic communication and information services to the restructuring of manufacturing, education, health, government services and the other sectors. A forward looking telecommunications policy must encompass these considerations and help prepare the ground for innovative and effective applications.

Convergence has been proceeding at a much slower pace at the policy level than it has at the technological or industry levels. To date, policy convergence has tended to lag, not lead or direct the course of change. The challenge for the 1997 review is to make policy sufficiently forward looking to pull through beneficial change and head off potential problems in advance, rather than provide an ex post ad hoc cleaning up of issues already upon us.

History would indicate the review most probably will earn an 'A' for effort and a 'D' for innovation, leaving policy development a close third behind technology and industry in adapting to the changing environment. All institutions resist change, and most only adapt when they have no alternatives. In recent years we have witnessed the largest corporations restructure to establish more horizontal, flexible and responsive network-based management structures. Government agencies are not subject to the same disciplines of the marketplace as is industry. Therefore governmental organisational structures tend to reflect yesterday's society more than tomorrow's.

Without the same driving force for change, the old structures continue to prevail until their obsolescence is blindingly apparent. Clearly, the current departmental structures of both the Commonwealth and State Governments — with a few exceptions — are not designed to foster integrated policy developments across sectors.

Applications are fundamental to the next step of microeconomic reform. Policy for the future must move beyond telecommunications restructuring issues and provide increased attention to the linkages backward and forward. To date we have been preoccupied with the telecommunications facilities network and duopoly competition. We have been less concerned about the relation between the network and the resources necessary to develop it effectively, or the relation between the network and the services that will be supplied over it in dynamic new markets. We have not been much concerned at all yet about the applications in other sectors. The net effect of the changes now unfolding is to bring the entire economy more and more on to an electronic communication base. We haven't come to recognise the significance of placing the whole economy on the telecommunications system.

Take education as an example. The requirements of training and learning for the 21st century will demand that distance education and computer assisted learning move from the fringes to the centre of our learning system. We will have to move education on to the electronic communication network. Yet there has been little convergence between telecommunications and education/training policy development. For the future, we do not want to invest primarily in standalone educational institutions. Investment must focus on communication and information services, new forms of content, more diversified access and teachers who facilitate learning in this new environment. The development of a whole new structure of communication is essential to designing an educational system for the 21st century. Can it be designed effectively without a telecommunications policy specifically pinpointed to educational needs, resources and special applications? Probably not.

Paralleling the strategic alliances between Telecom and its equipment suppliers, strategic alliances on the user side are beginning to appear with regard to media and multimedia development. But what about strategic alliances with regard to the education and training sector, or the health sector, or a number of other sectors?

These important policy issues can only be addressed effectively by greater co-ordination and integration of policy development that links telecommunications to the resource and application sectors. The 1997 Ministerial Review provides a unique opportunity for policy to lead and direct development. Attention to knowledge gained from research by organisations like CIRCIT and other centres throughout Australia will increase the chances of policy being able to lead rather than follow events.

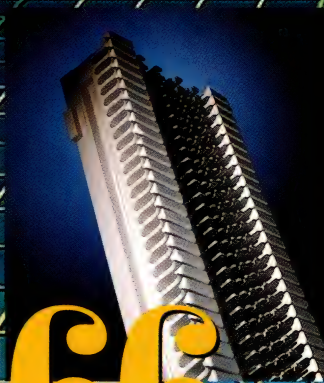
*Bill Melody is an international telecommunications consultant, and was Founding Director of CIRCIT (1989-93).*



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# Bringing Quality Management to Cabling Systems

Strenuous efforts by international standards groups have brought order to the world of cabling. The challenge now is to apply modern quality assurance procedures to cabling installations.

The great communications cabling standards battles that have raged around the world in recent years have now largely been fought and won. After much debate in the standards communities, commonly-based basic national cabling standards are now in place in many countries and network managers can now select cabling and componentry from numerous vendors safe in the knowledge that it will be standards-compliant. This happy state of affairs has led many to suggest that the 'first wave' of cabling technology has now passed and the 'second wave' is now breaking for voice and data cabling.

Typically, the first wave in technology focuses on making it work. Vendors race to get product to market that provides the basic performance necessary to achieve sales. The major hurdles in the first wave are all associated with convincing prospective customers that their brand will work as claimed. The second wave of a technology arrives when the basic technology has been conquered, when any competent R&D facility and manufacturing plant can produce the technology in working form. At this time the basic principles have been widely discussed and are widely understood. Because no one vendor holds a technical monopoly in the marketplace at this time, competition is based on issues such as product quality and consistency, the flexibility of the physical form of the product, the scope of support and the range of accessories.

As part of this second wave, we are now seeing a new batch of international standards (see 'The Quest For Common Cabling Standards' on page 73) that give more emphasis to cabling as a *system*, rather than concentrating on component specifications as the first wave standards tended to do. Further signs of the second wave are evident in the increasing range of cabling accessories attuned to the requirements of architects and designers. The systems approach in the standards is also impacting the marketplace in the form of alliances between accessory and cable vendors (such as Krone and MM Cables) to offer a full product range that has the manufacturer's guarantee. Single source suppliers (such as AT&T and Mod-Tap) and the supplier alliances are also providing certified training schemes for installers. Together, these developments indicate a maturing of both the technology and marketplace.

But perhaps the most telling indicators of all that a new era in cabling has arrived have been statements by US and international standards bodies that cabling systems assembled from qualified components and abiding by the specified installation techniques can be assumed to meet the overall link performance standards without further testing. The role of testing is now viewed as a means



of finding lapses in workmanship rather than proving that the cabling system can work. This demonstrates one of the most important characteristics of a technology second wave — a focus on quality of implementation.

So what does this mean to someone who needs to get their office cabled? Can they now just write a purchase order specifying 'One only: standard cabling system'? Well, not quite. In the same way that we cannot order a standard PC or WAN or LAN operating



system without specifying the particular requirements and configuration details, cabling will probably never reduce to that level of simplicity.

However, with cabling we can now focus on issues of configuration and quality, without getting hung up on issues such as what type of wire do I need, which application will work on which type of wire, and is it safe to commit my business to an integrated cabling system?

## Defining Quality

What does 'quality' mean in the context of delivering or producing goods or services such as a cabling system? The meaning of quality that is relevant here is a system such as that which is defined in standards like the AS3900/ISO900 series that are gaining such prominence throughout industry in this country and around the world.

In this context quality is a measure of the degree of match between what is expected and what is delivered. Quality is not about gold plating and doing extra work. Quality is not necessarily about the most exotic and most sophisticated version of a particular product and service; it is about the confident delivery of exactly what is required, or, to use the phrasing that has been made popular by one of the community service clubs, 'Do it once, do it right.' You only get it right if you know what you are trying to do and check along the way to see if what you are doing matches or contributes to the goal you seek to attain.

If you think this through you can see that quality flows right through from the formative stages of an activity, such as pre-sales work and definition of requirements, right to the handing over of the finished product or service to the person who requires it.

The modern approach to quality is somewhat different to many of the traditional manufacturing-oriented quality systems which worked by thoroughly checking a product at the end of the production line. This led to either its acceptance and shipment, or its rejection, and re-work through the manufacturing process. That sort of system only works well if you can be confident that the goods at the end of the process are going to be generally be in line with what is required. However, when faults are identified it becomes a very expensive process because of the level of re-work which is required to rectify any deficiency that occurred early in the manufacturing process.

It is the expense of re-work that led to the development of current approaches to quality systems. Modern quality systems break large processes down into smaller pieces, so that:

- Checking becomes easier, because there is less to check at each step;
- Errors have less impact, because they are detected sooner after they have occurred, and

■ Correction is simpler and cheaper, because correction only has to be applied to the most recently performed activity. But quality systems do more than just break down the checking and correction process into smaller cycles. They identify what people must do in order to achieve goals and produce the required goods or services; and they define how those tasks should be performed and separate them from the day-to-day management or basic job skills.

Quality systems also require records be kept of what is being done, with what inputs, by whom, and who checked it. These records are most important as they allow the separation of the results of occasional, random deviations from the results of structural deficiencies in the processes or in the system itself.

When defects do occur, it is important to separate structural deficiencies from isolated deviations. Structural defects occur because the process is not working, or people have not been properly trained, or the inputs to a process are not of the appropriate type or grade. By correctly identifying these types of errors, they can be corrected once for all time, thereby eliminating that source of error in all future outputs.

Many of these issues are not revolutionary in themselves. The underlying philosophies have existed individually for some time. What is of significance is that what were previously separate approaches or separate quality issues have now been brought together into a set of general principles which can be applied to anything — including cabling systems.

## The First Steps

Quality in cabling systems starts with the definition of the requirements, either by the purchaser, a design professional, or as part of the pre-sales activity of the supplier. Defining the requirements correctly is vitally important because without a correct definition, there is no way to determine what to supply or to be sure that what was delivered meets the requirement. This is one of the most common sources of disagreement, ill-feeling and even litigation when it comes to the delivery of goods and services, particularly in the technology areas.

As well as clearly identifying requirements, a key step is to ensure that they match user expectations. Some of the worst disagreements — often within organisations — have been because of a mis-match between what is delivered and the expectation. The design documents and specifications provide an invaluable tool by which requirement and expectation can be aligned, before committing to any expenditure.

The second step in the quality process for a cabling system is the design. The design process takes the requirements and translates them into a physical description. A sound approach to quality will ensure that

the design properly represents the requirements, has not left anything out that is necessary, has not left anything to chance that should be specified and is capable of being implemented.

The processes of contract preparation, negotiation and ordering are also candidates for the application of quality control. The goal at this stage is to ensure that what is being ordered is that which is required by the design. Whether you are ordering the cabling system from the installer or whether the installer is ordering components from a supplier, each needs to be sure that the items ordered match what the design calls up, that they are going to be delivered at the dates required, and that the terms of dealing are clearly presented so that everyone understands their responsibilities.

In many cases, all that may be required to manage this stage of quality process may be a simple check list. The process need not be an onerous one. The significant issue is that important steps are not overlooked.

Typically, contract issues only take on major significance when something goes wrong and when difficulties do arise, often due to misunderstandings, then all that matters is what is written on paper. Therefore having a design and a specification that documents exactly the client's requirements and how those requirements are to be physically implemented is a vital tool to:

- Communicate to the supplier what he is expected to install;
- Allow him to quote accurately;
- Purchase the right components;
- Apply the right workmanship standards; and
- Verify that the completed work meets the customer's requirements.

This is quite different to providing a very broad and loose statement of requirement and then expecting (or hoping) that the supplier will do the right thing because that is how it ought to be done. The only way to define quality expectations is to put it in writing so as to minimise the scope for misinterpretation. This doesn't guarantee that there will be no room for disagreement or misinterpretation, but having nothing in writing or having it presented in an unclear or confused fashion multiplies, by many times, the chances of a disagreement arising.

## Installation

Installation is the most visible stage in the cabling process, although in the context of the earlier stages it is not necessarily the most important. From a quality perspective, every stage in the procurement and installation of a cabling system is important because each is totally dependant upon the step that goes before.

The starting point is to ensure that cabling is correctly located. Look out for other

*Continued on page 78*



## The Quest For Common Cabling Standards

There appear to be a lot of similar cabling standards coming from a lot of different organisations. To understand why there are so many, and how they relate to one another, it is important to understand the evolution and development of modern cabling systems.

Around ten years ago, users and vendors alike began to realise that the continual re-cabling of buildings for data networks was expensive, time consuming and wasteful. After all, buildings had been pre-wired for telephone services for many years and moves and changes to telephone cabling were confined to just the last short run of wire and a few jumpers on a terminal block somewhere — why couldn't it be the same for data cabling? Accordingly, a number of major players such as DEC, IBM and AT&T started work on a new approach — and soon realised that data networking needed to converge on a single type of cable. The then-current variety of twisted and untwisted wires with and without shields and multiple types of coaxial cable made a uniform approach to cabling impossible. In addition, the requirements of telephony and data were seen to be rapidly converging, so a single system to support all telecommunications was obvious and desirable.

Concurrent with its development of the Token Ring LAN protocol, IBM settled on shielded twisted pair (STP) cabling as the basis for its data standards with low grade unshielded twisted pair (UTP) for voice. The Ethernet camp focused its attention on producing a new specification designed to run over unshielded twisted pair cable rather like telephone wire. But it was quickly realised that higher grades of cable than were used for telephony would be needed and the Institute of Electrical and Electronics Engineers (IEEE) proceeded to produce the 10Base-T standard for Ethernet over 'data grade' UTP. This led to a rash of product announcements by AT&T, Digital, ModTap, the Siemon Company and many others of cabling materials and accessories to support it.

The US Telecommunications Industry Association (TIA) formed a committee to look at standardising this new popular form of cabling. The TIA is an offshoot of the US Electrical Industries Association (EIA) which has produced standards for segments of the communications industry for many years. Most will be familiar with the EIA specification RS-232 that has defined the serial interface found on most modems and terminals since the 1960s.

In the area of cabling, the TIA was endorsed by the American National Standards Institute (the official US standards

### Cabling Standards Around the World

#### UNITED STATES

**ANSI/EIA/TIA-568** — Commercial building telecommunications cabling standard. Published in 1991, this was the first integrated or generic cabling standard to be published. It specified materials to what is now known as Category 3.

**ANSI/EIA/TIA-569** — Commercial building standard for telecommunications pathways and spaces. Describes appropriate materials and approaches to the design and installation of ducts, cable trays, risers, conduits and similar facilities for accommodation of telecommunications cabling.

**ANSI/EIA/TIA-606** — Administration standard for telecommunication infrastructure of commercial buildings. Sets out the data required and a scheme for managing the data relating to the cabling infrastructure in buildings. Strongly slanted at designers (and users) of administration systems implemented by way of a computerised database.

**EIA/TIA TSB-36** — Additional cable specifications for unshielded twisted pair cables. The original specification for Category 4 and 5 UTP cable, and including more comprehensive specifications for Category 3.

**EIA/TIA TSB-40** — Additional transmission specifications for unshielded twisted pair connecting hardware. The original specification for Category 4 and 5 connecting hardware, and including more comprehensive specifications for Category 3.

**EIA/TIA TSB-40A** — An update to TSB-40 which refines the content in some areas of its predecessor.

**EIA/TIA TSB-53** — Specification for STP-A cable, an upgraded version of the STP cable originally designed by IBM (Type 2). STP-A is specified for operation up to 300 MHz.

**EIA/TIA SP2840-A** — Commercial building telecommunications cabling standard. This is the draft of an update to ANSI-568. It has now been circulated for public comment and

should be published as ANSI-568A in late 1994/early 1995. The technical content is virtually the same as ISO 11801 and there is strong lobbying to make the technical specification identical.

#### AUSTRALIA/NEW ZEALAND

**AS3080-1992** (Telecommunications Installations — Integrated telecommunications cabling systems for commercial premises).

**AS3084** (Telecommunications Installations — Telecommunications pathways and spaces for commercial buildings) — A rewrite of ANSI-569 to reflect current Australian and New Zealand building design and construction practices and materials.

**AS308x.1 (DR93303)** (Telecommunications Installations — Administration of communications cabling systems: Part 1 Basic requirements). Defines the minimum requirements for the administration of a cabling system, drafting symbols for indoor and outdoor cabling plant, and a pro-forma for a paper-based records system.

**AS308x.2** (Telecommunications Installations — Administration of communications cabling systems: Part 2) — A more complete treatment of cabling administration requirements, especially suited to large or complex installations requiring computerised records management. Expected to be a reproduction of ANSI-606.

**DR94218** (Telecommunications Installations — Integrated telecommunications cabling systems for commercial premises) — This is the draft of an updated AS3080. It is based on the ISO 11801. Expected to be published as AS3080-1994.

#### INTERNATIONAL

**ISO 11801** (Information Technology — Generic cabling for customer premises). This standard has been voted on by all ISO members countries and is expected to be published before the end of 1994.

body) as being the nominated body with responsibility for producing US cabling standards. Thus standards produced by the TIA for cabling were destined to become ANSI standards. This is a similar situation to the IEEE setting standards on behalf of ANSI for LANs.

Like all good standards bodies, the Telecommunications Industry Association is divided into a number of committees, sub-committees and working groups. The TR-41.8 sub-committee was formed with specific responsibility for telecommunications cabling within buildings and subsequently Working Group TR-41.8.1 was given responsibility for producing the base wiring standard. Work was commenced in 1985 and culminated in the publication of the EIA/TIA/ANSI Standard 568 'Commercial Building Telecommunications Cabling Standard' in July 1991.

### Categorising Levels

This was the first of the 'first wave' specifications and focused on a universal cabling architecture and the basic material and component specifications for carrying 10Mbps Ethernet and 4Mbps Token Ring on UTP, 16Mbps Token Ring on STP and broad references to optical fibre cable in building backbones. Development of the standard started with what was practical and available at the time, and built these up into an overall system approach.

Subsequent developments in cable and component technology allowed the extension of the UTP cabling approach to support 16Mbps Token Ring networks on UTP but, almost as soon as the numbers were agreed on, manufacturers realised that they could push this same technology much further. With reasonable effort they



## The Quest For Common Cabling Standards (Cont.)

found they could achieve successful operation at up to 100 MHz, so a range of grades of cable started to emerge.

There had been a number of proprietary cable and hardware specifications produced by this time, generally described by 'Level' numbers with higher levels indicating higher performance. Unfortunately not all the definitions were the same, so when the EIA was ready to register its two higher grades of cabling materials, they chose to call them 'Categories' to avoid confusion with the variety of 'Level' standards.

To avoid confusion with loosely specified telephone wire and some lower speed data cables commonly in use at the time, the EIA started its numbers at Category 3 for the basic 10Mbps materials, and called the higher grades Category 4 and Category 5. The specifications for cable and hardware materials were published as TIA Technical Services Bulletins No. 36, 40 and 40A, and were in effect appendices to the original ANSI-568 standard.

### Following the US Lead

Australia is trying hard to be 'less different' to the rest of the world than it has been in the past. In the area of standards setting, there is a clear recognition that we are increasingly part of a global community and must look beyond the limits of our own local needs. Increasingly Australia and New Zealand are cooperating in standards activities.

In 1990, Standards Australia formed a Standards Committee in its IT Division to examine cabling issues and committee IT/17 tracked the research activities in the US closely and developed an Australian standard based around ANSI-568 in anticipation of its publication.

However, at the time there were significant variations between the regulatory approaches in the US and Australia and the committee felt that there were some important issues which the TIA had not addressed. So when Australian Standard 3080 was published in May 1992 it consisted of a number of short sections dealing with these issues and then included ANSI-568 in its entirety as a normative appendix. ('Normative' is standards-speak for: 'this part is to be treated as if it were part of the body of the standard.' They use the term 'informative' to indicate appendices which are there for the benefit of readers, but which are not part of the actual standard.)

Standards Australia has a policy of adopting international standards wherever they exist in suitable form, but at this time there was no relevant international stand-

ard in existence. Hence the choice to follow the US direction. The other option would have been to wait for an International Standard to be published. The IT/17 Committee believed that a standard was required in the marketplace as soon as possible to serve the interests of both users and suppliers. In fact this belief was proven true in a resounding fashion. AS3080 turned into an all-time best seller, with more copies being sold than even the latest edition of AS3000 — the Wiring Rules for electrical installations!

### The ISO Catches Up

Of course things were not totally quiet on the international front throughout all of this time, but perhaps a little (or, less charitably, a lot) slower. The European-driven International Standards Organisation (ISO) works jointly with the International Electrotechnical Commission (IEC) on matters of electrical technology. It carries out this work through Joint Technical Committee 1 (JTC1). Within this Committee Sub-Committee 25 and Working Group 3 carry responsibility for the cabling that interconnects information technology equipment.

JTC1/SC25/WG3 made the decision not to follow the American pragmatic, bottom-up approach to producing a generic standard for telecommunications cabling. Instead they chose to pursue a classical top-down approach starting with the requirements in principle and finally working down to physical implementations. It is interesting to note that for a variety of reasons (not least of which was the growing range of ANSI-568 compliant products on the market and the number of installed cabling systems) Working Group 3 finally arrived at the same technical point as the TIA TR41.8.1 Committee had arrived at some two and a half years earlier.

There are, however, some significant differences, one being that the ISO divides applications into 'Classes' on the basis of transmission bandwidth. It then cross-references those to the performance capabilities of particular categories of cabling materials. The final output of Working Group 3 has been the draft International Standard 11801. This was put out for international ballot in January 1994 with a closing date of July 1994.

Meanwhile, the TIA's latest revision draft of ANSI-568 (SP2840A) has adopted much of the technical content of the ISO standard, if not the format.

It should be noted that a number of significant contributions were made to the work of the ISO group by the Committee members representing Australia. Numerous times blockages to progress, ap-

parently based on parochial interests, were broken through thanks to the development of imaginative new approaches by the Australian delegates.

However, despite the best efforts of all concerned, different regulatory environments have inevitably led to regional variations and accommodations. ISO 11801 thus contains a number of accommodations for established European practice and Australia's DR94218 (the draft for the new edition of AS3080 based on ISO 11801) has accordingly been modified for our environment.

Probably the most notable European-inspired element of ISO 11801 is the inclusion of 120 Ohm UTP cable (in recognition of a significant installed base of such cable in countries like France and Switzerland) and it allows the splitting of four pair cables between two outlets, each served by two of the pairs. This practice has been used for some time by a number of telecommunications administrations in Europe.

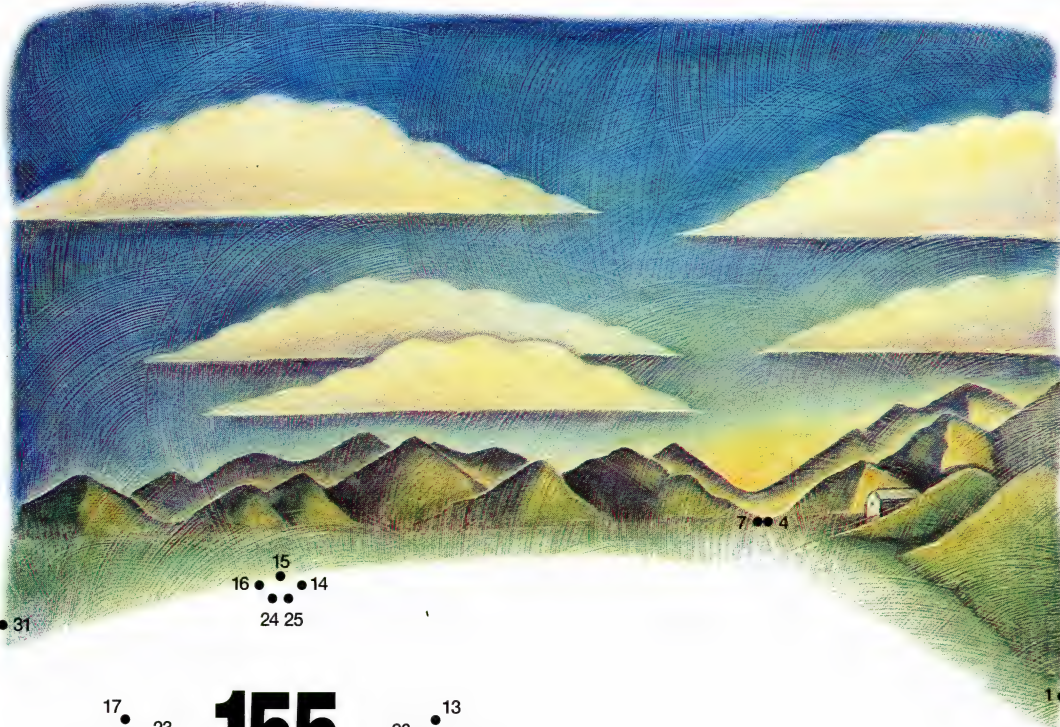
The Australian changes are thankfully relatively minor and the majority relate either to slight differences in test methods so as to accord with local standard practice, or they remove the scope for variation introduced in the international standard to cater for the Europeans. There are also one or two items where Australia has chosen to be slightly more prescriptive in the interests of simplicity and uniformity which the international community did not feel was realistically achievable on a global scale.

The specific requirements for cabling that are impacted by Austel technical regulation have now been isolated into an informative index (i.e. it passes on information contained in other sources but is not itself part of the body of the standard) and these provide a simple means of correlating the cabling standard to Austel's legally enforceable regulations. In the next edition of the Australian standard, Australia will be little different from the rest of the world.

Meanwhile, the IT/17 Committee has not been resting on its laurels. It has also produced a standard (AS3084) for telecommunications pathways and spaces within buildings that describes appropriate means of providing physical routes for telecommunications cabling within the structure of a building and its surrounding areas. Work is also substantially completed on a pair of standards addressing records management and administration of cabling systems in both simple and complex sites. The first of these should be published before the end of 1994.

**Graham Bell**





17  
18 • 23  
19 • 22

**155**  
**Mb/s**

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26 • 12  
27 • 11

21  
20 • 10  
28

• 30

• 29 9

• 8

• 6

• 5

• 3

• 2

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## Testing To Be Sure

A key part of the implementation strategy for a cabling system should include the design of a testing regime that is appropriate to the final verification of what is delivered. Those tests should be aimed at proving the suitability of what is installed against the requirements.

The complexity of the testing required will generally be proportional to the physical size of the installation, (where size includes both geographical spread and the number of outlets), and the complexity of performance or the speed of operation which is required. Testing may also be more complex in situations with unusual requirements, such as those that must meet strict EMC or physical security requirements.

If provided by a reputable supplier, it should not be necessary to verify that all the cables and connectors comply with Category 5 specifications. Testing should be designed to detect deviations associated with the installation and a sampling technique can be employed.

### Help at Hand

To aid network managers in troubleshooting high-speed networks, several vendors now sell handheld testers for evaluating Category 5 installations, including: Microtest, Scope Communications Inc., and Wavetek. Testers evaluate the entire link, including cables and connectors.

This new generation of handheld testers offer several improvements over the only other alternative to testing Category 5 cabling, which is to use a full-blown network analyser. First, handheld devices are light enough to be toted easily around the most difficult installation sites. Second, they deliver easy-to-understand test results. Third, they cost significantly less than full-blown analysers.

On the downside, handheld testers cannot match the ability of the most sophisticated network analysers to measure all network conditions in extremely fine increments. And more importantly, handheld testers have a significantly wider margin of error. Tests by the US TIA have confirmed that results from handheld testers can have a margin of error as high as 2 decibels. In contrast, network analysers are accurate to within 0.1dB.

The 2dB margin of error for handheld testers has become a source of fierce debate. Critics of handheld testers — including cable makers like AT&T and Northern Telecom — claim that 2dB is too great a margin, and that it has led to cases in which handheld testers have erroneously identified problems on perfectly good Category 5 connections. Vendors of hand-

held cable testers counter that 2dB margin of error is inconsequential considering the size of the measurements their testers are taking (a maximum of 27.1dB of NEXT on a Category 5 link running at 100Mbps, for example).

Nevertheless, there is another reason why network managers should view results given by handheld testers with a somewhat jaundiced eye. Vendors selling these products claim to be able to test installed cabling and connectors according to EIA/TIA specifications. In fact, those specifications are still under development by the TIA TR-41.8.1 Link Performance Task Group, and its work is not expected to be complete until the first quarter of next year.

A closer look at product small print reveals that most handheld testers are really testing to an earlier document, called SP-2840 Annex E. This puts them on shaky ground, because Annex E was developed specifically for use in controlled laboratory environments as an aid in designing equipment transceivers, and not as a tool for verifying the performance of installed Category 5 cable. "Annex E says you have to test the link at a constant temperature, but if the cable is in the wall you've got no idea how hot it is," points out Neil Allen, Product manager at Fluke Corp., a manufacturer of cable testers. Temperature variations can easily bankrupt results, he says.

The US TIA is emphatic on this point. 'Since TIA specifications for testing installed UTP cabling are not yet completed, installed UTP cabling links are not certifiable to TIA specifications,' the organisation announced in a fact sheet released earlier this year.

Still, companies now selling Category 5 testers say they expect the TIA TR-41.8.1's subgroup's recommendations on testing installed cable and connectors to be based substantially on Annex E.

### A Sample Scheme

For non-trivial cable installations, a testing scheme based on Australian Standards for statistical sampling methods (such as AS1199, which covers sampling procedures and tables for inspection by attributes) has proved satisfactory. The approach is based on similar principles to those used by financial auditors.

The first test is most easily performed before the wall plates and patch panels are closed up and fixed in place. The rest should wait until after the installation (or at least a significant section of a large installation) is completed, so that valid samples can be taken.

1. All cable runs should be tested for pair allocation and polarity;
2. A random sample of 10% of all copper cabling, taken from throughout the installation, is tested for:

- Crosstalk between adjacent cables;
- Crosstalk on individual cables (near-end crosstalk, or NEXT); and
- Link attenuation.

At least half of the cables tested for NEXT should be tested from both ends. For preference, these tests should include representative equipment leads at each end, a patch cord and the patching equipment to simulate the true end-to-end link that applications will use. ISO 11801 tabulates limits for installed cable links.

3. If any defects are found in the sample tested, two further checks are required:

- Firstly, if the occurrence of faults is related to a batch of components or a particular tradesman (readily verified for the installer's quality records), the remainder of the batch or tradesman's work should be 100% tested and all faults corrected;
- Secondly, if the faults are random (i.e. they do not correlate in this way), a second 10% random sample should be tested. If there are no faults in this sample, accept the installation as the faults in the first test can be taken to be isolated errors.

Note that if the second random sample shows faults, a 100% test of the entire cabling installation is then warranted, as the samples have demonstrated that there are likely to be faults scattered throughout the installation.

Due to the greater skill levels required for the termination of optical fibre cables, it is more likely that lossy terminations will occur than with copper cabling. It is always a very wise precaution to test all new optical fibres (even those unterminated) for loss and reflection characteristics on all cores. This testing will help identify cable stress and damage due to poor installation practices, as well as poor terminations.

The only test to be considered seriously for fibre is an optical time domain reflectometer (OTDR). This produces a graph of the fibre loss along its length.

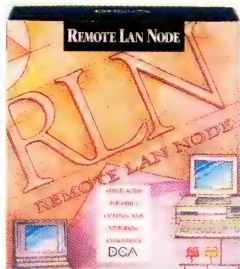
- Connectors show as a 'blip' with their loss, mostly due to poor polishing, indicated by a difference in height between the two sides of the blip;
- The rest of the trace should be a fairly clean slope. Strain along the length of the fibre (such as where it bends down over the wall) will show as a small blip. There should be none of these.

**Graham Bell and Stephen Saunders**



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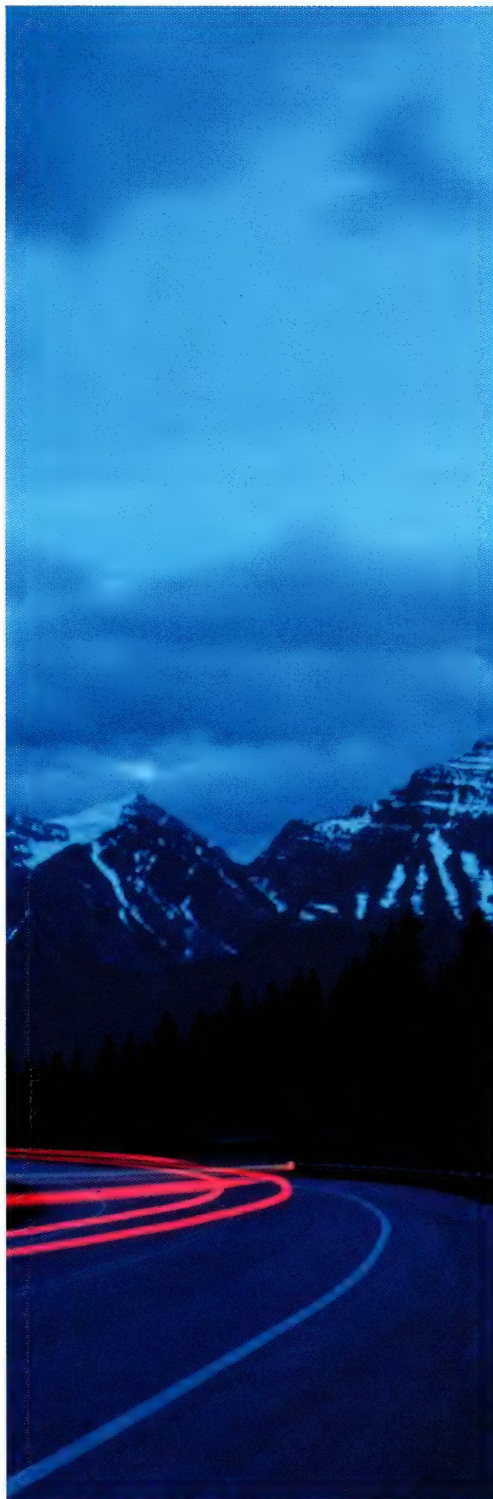
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From page 72

electrical services, especially when other trades are following the communications cable installation. Space between those services and communications communications cabling is the key to protection against interference. Chief sources of problems are fluorescent lights (whose wiring seems to run uncontrolled around the ceiling space in most buildings) and circuits supplying motors that are switched by contractors or thermostats (e.g. air conditioning fans, refrigeration equipment, etc.) Many service engineers are yet to learn that the allocation of space to each service is something they must take responsibility for.

AS3080 includes a table for recommended separation distances. These apply to long runs, so separation distance is not so critical for short parallel runs and cross-overs but try to observe the greatest separation practical in the (usually limited) space available. If all else fails in the fight for space, enclosing either the power or the communications cables in earthed galvanised ducting may be appropriate. The key is to make sure the earthing point itself is free of interference, such as at the distribution board for the floor.

After scoping the location and commencing installation, the next step is to make sure that some standard guidelines are followed. Particularly watch for cable 'crush,' which commonly occurs in three places:

- Where bundles of cables bend around corners or down into wall cavities from the ceiling space. Cable bundles need to be supported so that none of the individual cables are bent too tightly — a minimum radius equal to four to eight times the cable diameter is generally recommended;
- Where groups of cables are bundled together tightly with cable ties;
- Where other tradespeople (especially air conditioning duct installers) have moved the communications cables.

Cable tension is another common problem area, and during installation should be kept within the manufacturer's specification, usually 50 Newtons per square millimetre of copper conductor cross-sectional area. That means anything more than a moderately strong steady pull on four pair UTP could mean future problems. If cable won't pull easily, take another look at how you are installing it — too many corners, catching on sharp edges, trying to pull too many cables together, cable tangles, etc. Remember that these points also apply to optical fibre cabling — only more so.

Terminating installed cabling presents its own set of problems and these often arise when too long a length of the individual copper pairs are untwisted. This is exacerbated when the sheath is stripped back too far because then the pairs lose their sup-

port. Category 5 cabling standards specify a maximum of 13mm of untwisted wire. This corresponds to approximately half the twist length of the wires and ensures the transmission properties (especially crosstalk and EMI/EMR) are not degraded.

The crosstalk problem stems from the way UTP pairs are untwisted and assigned to the eight pins in RJ-45 cable connectors. The first and eighth pairs can run alongside each other for up to 20mm within the connector. That's enough to cause significant 'bleeding' of data signals (crosstalk) between the two. Connector vendors use one of two techniques to compensate for this problem. The first is to add capacitors to compensate for signal imbalances. The second is to add a printed circuit board to ensure that data travels over the first and eighth pairs in opposite directions.

## Labour Pains

For Category 5 cabling schemes avoiding problems also means making certain that cable installers have retrained their workforce with the skill set required to handle Category 5 cable and connectors. This is especially important given that many of the practices forbidden on Category 5 schemes — including excessive untwisting, bending, and cinching — are second nature to technicians used to installing cabling for voice traffic or for Ethernet or Token Ring data.

Installation includes a lot of activities which need to be executed in an identical manner — for example: terminations, the physical finish in the work area, the dressing of cable in ceiling space, etc. Because these are repetitive activities, there is scope for sub-standard work to creep in. Every stage of the installer's work has some influence on the performance of the system, so steps are required to avoid problems arising. Again this need not be an onerous task if the quality of workmanship is aligned with what is required. If the requirement is for simple telephone cable, then attention to cable dress and twisting of wires at the point of termination, and so forth, does not need to be subject to the same close controls it would be if you were installing a Category 5 system.

Cabling experts suggest two approaches to weeding out slipshod cabling installers. The first is to quiz the installer's workforce on their knowledge of Category 5 installation techniques. One US network manager goes so far as to test every labourer using a hand-out sheet. "Right now, about four out of five fail the test and have to be retrained," says Ely Compean of the State of Texas Mental Health and Mental Retardation Board, who is supervising the installation of Category 5 cabling in 28 hospitals. A second approach is to ask for verification that the installer's technicians have been independently trained and tested in Category 5 work.

Accreditation to a recognised Quality Standard, such as AS3902, is one guide to a

reliable installer. AS3902 accreditation is dependent on the company demonstrating a solid commitment to staff training, maintenance of correct work procedures and inspection of all workmanship.

## Verification and Acceptance

It's crucially important to verify the installation as it proceeds. The job of correcting installation foul-ups can range from an inconvenient chore to an expensive reclamation project, depending on how badly the installation has been botched. Re-installing and re-terminating cables is pricey enough, but added to this is the expense of network downtime caused by outages while problems are located and rectified.

Checking may include visual inspection and the measurement and recording of the characteristics of the cabling system. It is clearly beneficial if the testing and certification of a cabling system can be performed in an incremental manner. If you consider a large complex installation, the philosophy of breaking down the checking process into small, easily corrected stages can result in major time and cost savings compared to leaving all of your testing and verification to the end of the job. By this time, incorrect work practices may have propagated throughout the job and other trades will have followed through, closing off or covering access for inspection or corrective activities.

Depending on the nature of the cabling job, a decree of incremental testing may also be warranted. For example, testing of cable pair allocations and polarity may well be appropriate very soon after termination and before face plates have been fixed in place, whereas the measurement of crosstalk and attenuation loss is more effectively performed after finishing off installation work because that will then reflect any deficiencies that may have arisen due to cables being crushed or distorted during the finishing off process.

A chore that should never be omitted from the final verification is the administrative information for the whole cabling system. Record-keeping is particularly important at this stage because if faults arise later the testing records will assist in determining whether there is a problem built into the cabling system or whether some other event has caused a problem to arise, for example physical damage to cables due to other work performed in the building. This should include: details of the location and termination of all cables, the correct labelling of outlets and their corresponding patch positions, and an appropriate recording system showing details of patching and common equipment connections.

While this information does not affect the technical functioning of the cabling system, it has a profound effect on the ongoing usability of the system. This becomes in-





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## ScTP: Beyond Category 5?

Network managers who've dutifully followed the advice of experts and installed Category 5 UTP as part of the transition to high-speed networking but failed to ensure that it was installed correctly may be in for a rude surprise when they start to deploy high-speed LANs.

In the US, experience has shown that companies with imperfectly installed Category 5 systems are running into performance problems caused mainly by excessive levels of electromagnetic interference (EMI) and near-end crosstalk (NEXT). Such performance problems aren't evident at lower LAN speeds, such as 10-Mbps Ethernet and 16Mbps Token Ring, because data is less susceptible to EMI and NEXT at lower rates. And to add to the angst, the networking rumour mill has been busy cranking out a host of reasons — many of them unfounded — for Category 5's problems. Meanwhile, most Category 5 UTP vendors are flatly denying the existence of any performance glitches, a kind of stonewalling that isn't helping to ease the fear, uncertainty and doubt in users' minds.

But a quick reality check shows that there's nothing inherently wrong with Category 5 cabling. In fact, some early reports of Category 5 performance woes have proved to be groundless. In some cases, early handheld testers built to diagnose faults in Category 5 cabling turned out to be buggy themselves. Poorly developed software drivers running on first-generation 100Mbps FDDI-over-copper adaptors also caused mediocre performance — a problem that has since been corrected.

The bottom line is that net managers who have installed their Category 5 cabling properly can rest assured that their schemes will carry data at 100Mbps.

### The Damage Done

However, justified or not, concerns about Category 5 cabling already may be forcing a redefinition of the premises wiring market. If nothing else, a prolonged scare could weaken Category 5's standing as an option for high-speed networking, motivating users to consider expensive but supposedly less problematic alternatives, such as screened twisted pair (ScTP), shielded twisted pair (STP), and fibre.

Category 5 UTP owes much of its popularity to a reputation for being the cheapest way to ready buildings for high-speed data. As well as being less costly than optical fibre, it's also cheaper than the two other types of high-speed copper cable — STP and ScTP.

Put simply, Category 5 UTP costs less because there's less to it. UTP comprises four copper pairs, twisted together and protected by a thin polyvinyl chloride (PVC) jacket. In contrast, ScTP uses four pairs wrapped in a foil shield covered in PVC. STP is even more complex — two copper pairs individually wrapped in metal shielding and then sheathed in a braided metal shield covered by a PVC jacket.

While less means more when it comes to keeping cable costs down, it also means that greater care must be taken when cabling is installed. ScTP and STP use the additional protection of metal shielding to prevent electromagnetic radiation from equipment such as elevator motors, air-conditioning units, or fluorescent lighting from interfering with the electrical signal on the cable. The same shield also serves to keep the intensity of the electromagnetic emissions generated by the cabling within guidelines.

In contrast, Category 5 UTP uses very tight twisting of copper pairs to achieve the same objectives. Poor installation practices quickly reduce its immunity to electromagnetic radiation from outside sources, while also increasing the level of radiation it gives off. Category 5 cabling also is more dependent on the components built into high-speed network adaptors to reduce emissions by filtering and balancing the data signal.

ScTP is known in some circles as foil twisted pair (FTP) or, erroneously, Category 6 cable. Advocates admit that ScTP costs more than Category 5 UTP, but they assert that the thin aluminum foil screen used to wrap the four copper pairs makes ScTP less susceptible to EMI than Category 5 UTP and also less likely to cause such interference itself.

Claims of ScTP's inherent superiority have yet to be substantiated by independent tests, however. Instead, US network managers are faced with a barrage of conflicting evidence from companies with a vested interest in ScTP's future.

For instance, a document describing comparative testing of ScTP and UTP by Siemens AG concludes that, at 100Mbps, UTP fails because of transient noise. On the other hand, new test results from AT&T, Hewlett-Packard, and Northern Telecom show that Category 5 UTP works just fine at high speed and will meet both European and US regulations regarding electromagnetic radiation. Siemens sells ScTP and STP cabling, while AT&T, HP, and Northern Telecom are key players in the world of UTP.

"Siemens has a hidden agenda to turn shielding into a religion," comments Paul Kish, Chairman of the United States Telecommunications Industries Association's TR41.8.1 committee, which currently has a sub-group working to develop screened cabling specifications.

But proven or not, claims about ScTP's superior resistance to EMI are helping ScTP garner a small but loyal following of users in the US. ScTP also has received a significant endorsement from long-distance carrier MCI Communications Corp. "Screened cable costs 8% to 10% more to install than Category 5 UTP," says Charles Stallings, Senior Communications Engineer at MCI's Colorado Springs offices. MCI has installed ScTP at 10 nodes in its internal network, scattered throughout the United States.

But not everyone is a devotee of ScTP. UTP's proponents argue that paying any premium for ScTP, however small, is unnecessary and a waste of money. Further, like Category 5 UTP, ScTP requires careful installation if it is to be effective. Specifically, installers must make sure that they ground the cable screen properly at each end of every cable connection. If the screen is grounded badly, it can actually act as a conductor, carrying interference from outside sources, such as elevator motors, throughout the cable scheme.

Kish of the TIA says tests conducted at the electromagnetic compatibility (EMC) test facility of Bell Northern Research have shown that if the screen in ScTP is not grounded properly, or if there is a small break in the screen, the cable produces more electromagnetic emissions than UTP. "Any break or hole in the screen acts as a focal point for radiation," Kish says.

**Stephen Saunders**

creasingly important over time as people change and memories fade. (See 'Untangling Cable Management Systems' in the February 1992 edition for a discussion of this aspect of cabling system management.)

After cable installation, the next important stage where quality applies is accep-

tance and hand-over. The step is a measure of how well expectations and requirements are met by what is delivered. It is entirely up to the parties to agree what form this acceptance should take. It should be defined at the outset, when orders or contracts are being executed. At this time a procedure

should be defined by which the supplier and customer are to reach agreement that the installed system corresponds with the stated requirements. This could take a variety of forms ranging from a statement of completion by the contractor or a demonstration of the customer equipment operating correctly





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(in a simple installation), through to a comprehensive range of acceptance tests performed by an independent party or performed by the installer and witnessed by the customer or his representative.

The important factor is that there is a defined hand-over point at which it is agreed between the parties that what is being delivered does in fact meet the stated requirement. That way all of the parties know where they stand.

After the cabling system has been installed and accepted there will inevitably be follow-on work. There will either be physical relocations of partitions and walls, or additions, or extensions to the cabling system, or damage that needs to be repaired, or the supply of additional items such as patch cords. All these after sales service activities are important; if they were not, they would not be initiated. Once again the customer has a requirement with certain expectations to be met by those providing the service.

Thus the service activity can be viewed as a condensed version of the system implementation process. The supplier needs to understand the requirement, be able to reliably supply what is required, and a method needs to be established which allows the parties to be certain that what has been delivered meets the requirement.

## Avoid False Economies

Poor quality usually arises from false economy. The steps required to install a cabling system with the appropriate quality do not have to involve additional cost. In many cases, the cost may actually be reduced because the cost of rework is so dramatically reduced.

Basic materials of a cabling system cannot be omitted to reduce costs so most often it is the processes which affect quality that tend to be omitted. These include requirements definition, design and specification, progressive inspection, testing, documentation, and formal acceptance.

By definition, anything which prejudices the delivery of a cabling system that meets the requirements will increase the probability of it failing to meet the requirement. Cutting back on quality measures will therefore increase the probability that additional work will be required to bring the installation back into line with the requirements. And that, of course, will involve additional expense.

Guarding against false economy is quite a different issue from specifying requirements which go beyond today's needs, with the aim of meeting future business requirements or extending the capital lifetime of

the finished system. This falls in the category of future proofing. As more high-speed schemes start rolling out, including IEEE 802.3 100Base-T fast Ethernet and IEEE 802.5 100VG-AnyLAN, cabling performance will become an even greater issue. And problems are likely to intensify once cable and equipment vendors start to push the envelope on copper performance by using it for even higher speeds, such as 155Mbps ATM.

If those extended capabilities are part of the business plan for your organisation, then they become requirements of the installation. When that is the case, the quality system is there to ensure that what is delivered will meet those requirements.

Quality is not about gold plating or obtaining the very best performing item of the type that is available. Quality is about *matching what is delivered to what is required*, so that what you need is what you get.

*Graham Bell is a Principal Consultant with Lane Telecommunications. He is a member of Australian Standards Committee IT/17 and is a frequent speaker at conferences and seminars on topics ranging from cabling and LAN/WAN design to Strategic Telecommunications Planning. He is based in Sydney. Additional reporting by Stephen Saunders of Data Communications magazine.*

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# Voice and Data — Achieving a Complementary Mix

Formed in 1991, the University of South Australia inherited separate voice and data networks from its antecedents. How could they be brought together with a minimum of disruption and cost?

While the merger and buyout frenzies of the 1980s are most closely associated with the corporate world, it wasn't only business that was faced at that time with the challenge of bringing together previously disparate organisations. The late '80s and early '90s also saw a rush to rationalise Australia's higher education system by amalgamating many of our then-numerous universities and colleges into a smaller number of larger institutions. Among the new institutions then formed was the University of South Australia, which came into being following an Act of State Parliament on January 1, 1991.

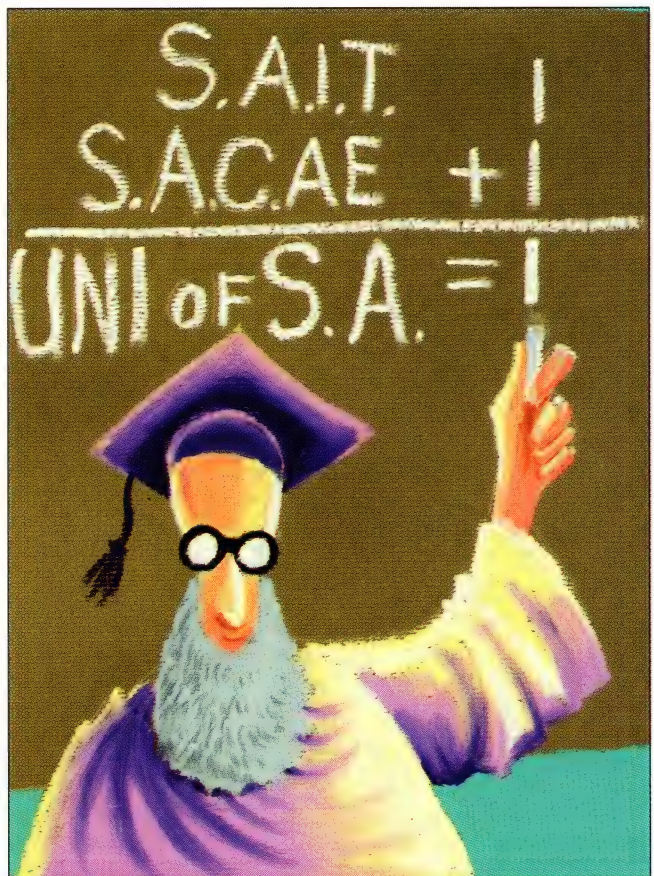
Amalgamations and mergers of course mean much more than changing the name plate out the front and printing new stationery — particularly for the communications network specialists charged with meeting the requirements of the newly-formed entity. There was a strong awareness amongst the new university's senior management that the new institution would be under considerable public scrutiny. It was about to compete for students and funding with two other local universities, and for many of its potential clients and benefactors the first contact would be via telephone. The new university had to be seen as well organised, effective and efficient and its voice and data communications systems were recognised early on as having a crucially important part to play in building that image.

To meet that challenge, the university charged its Telecommunications Steering Committee (TSC) with the provision of effective, efficient voice and data facilities to service all campuses. Assistance to implement the voice services was sought from Consultel Australia, a consulting firm which had aided the various component institutions in the past, and was familiar with existing equipment, network configurations, problems and operational issues. Because of the variety of equipment, protocol, software and specialist requirements of the various campuses and facilities, integration of the data systems was kept in-house.

## Wide Geographic Spread

The University of South Australia was formed from an amalgamation of the South Australian Institute of Technology (SAIT) and several campuses from the South Australian College of Advanced Education (SACAE).

The SAIT comprised three campuses; the City, a campus within the precincts of the City of Adelaide, directly adjacent to the University of Adelaide and Royal Adelaide Hospital; The Levels, an urban area some 14km north of the city and adjacent to South



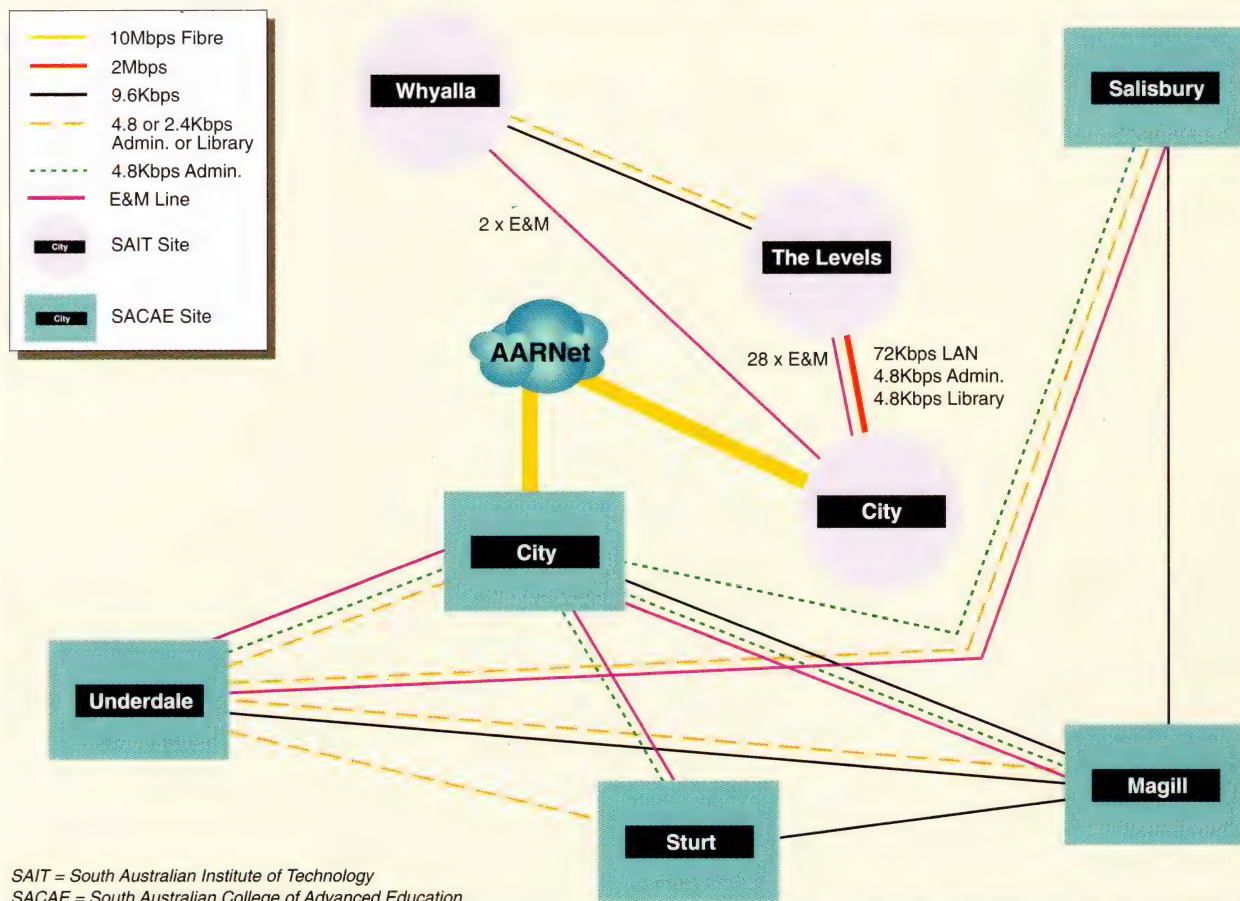
Australia's Technology Park; and Whyalla, a large rural city in South Australia's Iron Triangle, 200km north west of Adelaide near the northern end of Spencer Gulf.

Three of SACAE's five campuses were fully amalgamated into the new university: Underdale, (7km west of the city), Magill (7km east) and Salisbury (21km north). Another campus, the City, located in Kintore Avenue and on the same block as both the University of Adelaide and the SAIT was 'subdivided' between the University of



**Figure 1: The SAIT and SACAE Networks**

The University of South Australia was formed in 1991 following the amalgamation of the South Australian Institute of Technology and the South Australian College of Advanced Education. Prior to the amalgamation, each antecedent institution had separate voice and data networks based around a multiplicity of communications links.



South Australia and the University of Adelaide. The fifth campus, Sturt, serving the southern suburbs, was amalgamated with the adjacent Flinders University of South Australia.

## The Existing Networks — Voice

Each antecedent institution had separate voice and data networks, although both based their PABX networks around Philips D1200 switches. Although there was no feature transparency or closed numbering scheme available, centralised attendant operation had been implemented for each PABX network.

At SAIT, centralised operator functions at the City campus answered all calls to the listed directory number (LDN). Calls for extensions at The Levels were extended over tie-lines. However, the operators could not camp-on nor verify busy extensions. Any extension dialling another campus had to do so via a tie-line access code. Indial calls to each campus were possible, and any call could be transferred to another campus. Whyalla was serviced by conventional both-way exchange lines, and two tie-lines to the City.

At SACAE Centralised Operator functions located at the Underdale campus were achieved by a method commonly used with this generation of equipment. Each site had its own published LDN and each remote site was permanently night switched to several 'night switch' extensions (a feature of 'night switch' extensions is that they assume limited operator features so that calls can be transferred and camped-on etc.). Each night switch extension was connected as an external extension to the central site and terminated on a conventional exchange line circuit. A call to a remote campus LDN thus appeared as an incoming call on the central PABX switchboard. Once answered, a transfer sequence was initiated on the calling night switch extension circuit at the remote PABX.

Whilst the existing networks did provide a reasonable grade of telephone service there were a number of issues which had been highlighted during a detailed needs analysis. These issues were often not obvious to the telephone user, but were critical for operational efficiency and network management. They included:

- Philips had withdrawn from the PABX marketplace and long term support for

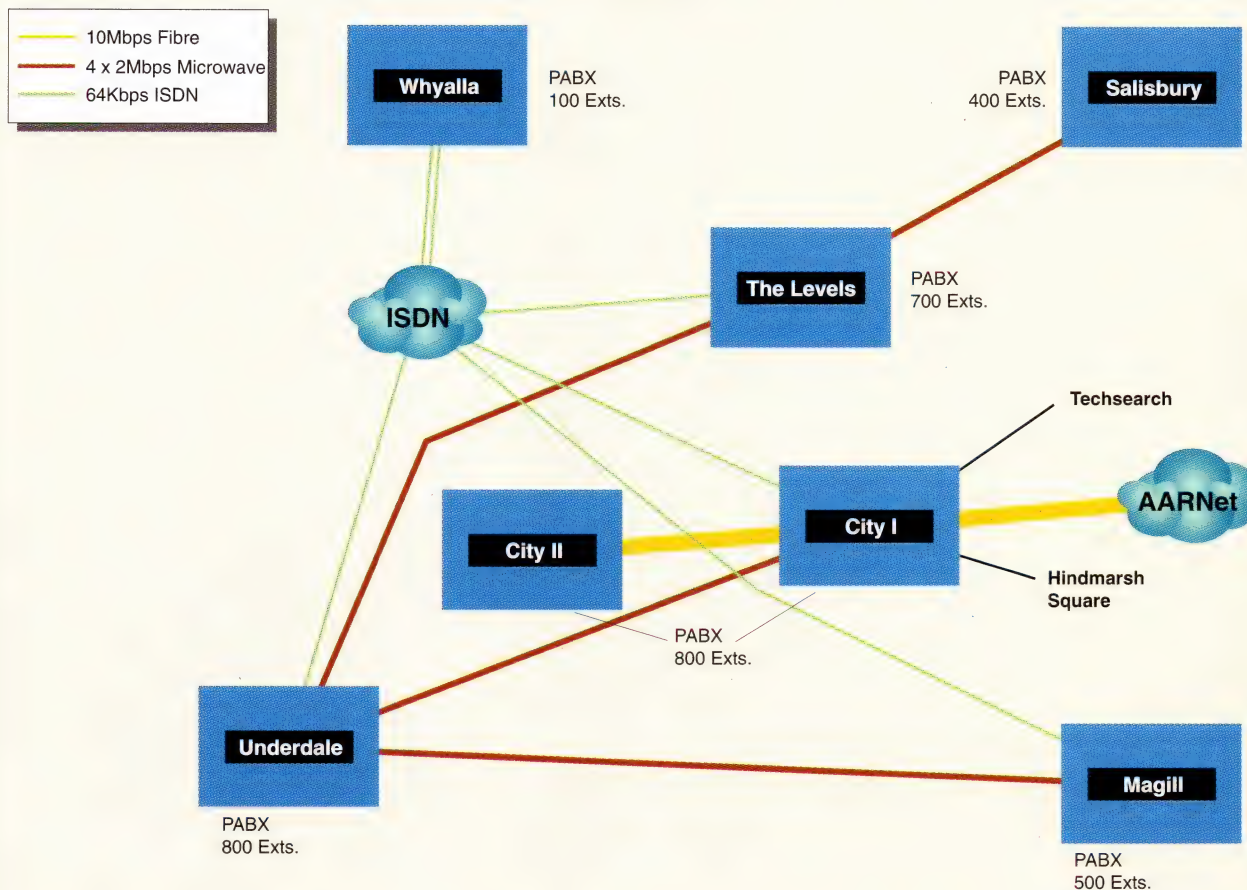
the existing equipment was thus not guaranteed;

- The existing PABXs could not reliably support fax or modem connections, leading to a proliferation of dedicated exchange lines to provide these facilities — over 60 in the City campus alone;
- Call accounting on the existing equipment never functioned correctly and the new university needed to implement accurate cost centre accounting practices;
- Traffic measurement and recording facilities were non-existent. There was no suitable method of quantifying whether existing routes (outgoing, incoming or tie-line) were providing a suitable grade of service;
- No system-integral telephones existed for Philips D1200 PABXs. To provide manager/secretarial functions key systems had proliferated, with the consequence of higher maintenance costs, difficult fault identification, lack of operating standards etc.;
- The existing PABXs could only support analogue trunks and there was a high incidence of faults on the tie-lines and tie-line calls were generally faint;



**Figure 2: The University of South Australia Network**

The University of South Australia's new integrated voice and data network is based around 4 X 2Mbps microwave links centred around the Underdale campus. The Whyalla campus is served by a 2 X 64Kbps ISDN connection.



- The old SACAE network required multiple directory numbers, one for each campus. Callers to one campus LDN could not be extended to an extension at another campus. This often led to dissatisfaction as a caller would be told to ring another number, only to be answered by the same operator;
- Centralised attendant facilities had very limited functionality to service remote network nodes. Calls could be answered, extended and (in the case of the SACAE) camped on, however, the operators needed to be aware of the significance of supervisory tones to indicate the progress of a call. Console displays such as calling extension number, diversion number, trunk number etc. did not function from the remote nodes, as the connection to the 'hub' was a simple two wire analogue extension;
- There were poor response times for telephone orders requiring PABX software changes. There was a lack of university expertise to perform anything but the simplest of changes and Telecom costs and response times had proven to be unacceptable; and

- PABX capacities may be exceeded by campus growth.

## The Existing Networks — Data

The SAIT data network was centred on The Levels campus with a 72Kbps share of a 2Mbps Megalink line used to connect to the City campus and a 9.6Kbps Telecom DDS link to Whyalla.

Ethernet LANs at The Levels and City campuses were connected via Wellfleet routers. DECnet, TCP/IP, XNS and AppleTalk were routed across the link, while DEC LAT (Local Area Transport) and MOP (Maintenance Operations Protocol) were bridged across the link. Whyalla's DDS link to The Levels utilised DEC's proprietary DDCMP (Digital Data Communications Message Protocol) between synchronous serial ports on VAX/VMS systems running TGV's Multinet (TCP/IP implementation) at each end. This meant that only DECnet protocols could be used directly, across the Levels/Whyalla link. TCP/IP connectivity was achieved by tunnelling IP through DECnet between the sites. The VAXes at each end effectively appeared to be IP routers for their respective subnets.

Before the merger, SAIT also had its own class B IP address range and each campus had its own subnet, using a 6/10 split so that the range could potentially be split into 63 subnets, each with 1,023 IP addresses.

Over at SACAE, the data network was hubbed around the Magill campus which enjoyed 9.6Kbps DDS DDCMP links to each of the other four campuses. At each end of those links were either DEC VAXs or DEC routers which (at that stage) could only route DECnet between a LAN and one or more WAN interfaces.

IP connectivity at the Institute was provided by tunnelling IP through DECnet in a similar fashion to SAIT's The Levels-Whyalla link. The SACAE also had its own separate class B IP address range and each campus had its own subnet, using a traditional 8/8 split so that the range could potentially be split into 256 subnets, each with 256 IP addresses.

The SAIT campus at The Levels had a highly developed fibre optic backbone for its Ethernet LAN which covered 70% of buildings, while the Institute's City campus had no fibre but had moderately high connectivity. The other sites at SAIT and the



SACAE had only small pockets of connectivity, centred on their respective computer rooms.

In addition to the LAN interconnections, the antecedent institutions each had proprietary Administrative systems. SAIT had an HP 3000 at the City campus with a 2.4Kbps DDS link to Whyalla and a 4.8Kbps share of The Levels-City trunk, using statistical multiplexers at each end, for remote ASCII terminals. SACAE had a network of Wang minicomputers centred on its City location and connected to minis at each of the other four sites. Each campus had moderate degrees of broadband Wang twin-coax wiring for Wang terminals.

These legacy systems maintained their own proprietary point-to-point communications links because they did not, at that stage, integrate with the LAN at all. This meant that, in some cases, parallel links were being maintained alongside the general LAN interconnection links. A way had to be found to integrate these systems into a new voice/data network to maintain current connectivity while providing additional connectivity for the extra campuses.

Each Institution also had two separate Library systems, neither of which would support TCP/IP. SAIT's Library system was based at The Levels, with its own multiplexer network, and the SACAE system was based at Underdale with yet another multiplexer network. Speeds of the Library links were generally 4.8Kbps.

The only bandwidth sharing in these old data networks was in SAIT's The Levels-City link. In this a multiplexer was used to split a 2Mbps Telecom Megalink into 28 tie-lines and a total of 128Kbps data. The data component was further split into 72Kbps for LAN interconnection, 9.6Kbps for Administration, 9.6Kbps for the Library and the balance for an energy management system.

## The Objectives

Based upon the collective experiences of the Telecommunications Steering Committee and the needs analysis study, a number of operational and technical criteria were established to be met by the new telephone network. The operational criteria were:

- A single main telephone number;
- Centralised operators with support facilities such as electronic directory;
- A simple and consistent numbering plan — it was anticipated that people would move between campuses, therefore consistency for telephone users, regardless of their location, was required i.e. a closed numbering scheme;
- The network was to be transparent to the user — there were to be no tie-line codes; PABX facilities (such as call back etc.) were to function network-wide;
- An ability to be able to take individual extension numbers to another campus was seen as highly desirable; and

- Whyalla should be included, and have full facilities like the metropolitan campuses.

In merging the two data networks, the major objective was to build an effective and widely available local area network, which would be able to cater for future administrative systems, as well as academic and research loads. Overwhelmingly, it was considered vital that network connectivity remain as undisturbed as possible during the transition period.

On the technical side, the Telecommunications Steering Committee determined the following criteria:

- The new network should be capable of integrating into (then) current technologies and any future ones which may emerge;
- Change was guaranteed — the PABX equipment had to be able to be physically reconfigured and parts of one PABX used to increase the capacity of another.
- The university wanted to perform its own system administration;
- The university required rapid disaster recovery procedures, so adequate local support was mandatory;
- Network management and call accounting facilities were mandatory; and
- To replace the existing mesh of links, a common inter-campus backbone for data and voice and able to support emerging teaching technologies was considered highly desirable.

## A Microwave Backbone

The changing relationship between the new University's campuses made estimating inter-campus traffic requirements difficult. On the voice side, a figure of 0.01 Erlangs/extension was arrived at based on SACAE tie-line quantities and a 2Mbps (30 X 64Kbps channels) link was seen as a minimum requirement. But would 30 channels suffice? Each route would need to carry approximately 10 Erlangs and require 20 voice channels. There were also incoming calls for distribution over the network to consider and these would require another 10 channels. But what about data? If it was to share a common inter-campus platform 2Mbps did not appear to be adequate.

The existing campus-based data networks, were on the whole quite small. The Telecommunications Steering Committee did, however, envisage rapid growth both in the number of connected workstations and the volume of traffic. The current loads on the LANs were on average about 15% utilisation, with peaks at The Levels Campus of 70%. Careful use of on-campus bridges was planned to isolate traffic to particular buildings where possible.

The first Administrative system to exploit the new connected LAN was a new Library system. The existing Administrative systems also needed to be connected to the LAN, in whatever limited capacity they

could support. It was planned that future major administrative systems would also use the LAN to provide general connectivity to the university community. This meant that the inter-campus links had to be of a reasonable speed.

But what were those links to be? Private cables, laser or microwave links, maybe even satellite circuits? The *Telecommunications Act* does not permit private cables between premises over 500 metres apart, so private cabling was out of the question. A laser-based system was potentially cost effective but there were serious doubts about the technology's reliability over the distances involved. Cost, propagation delay and echo problems also ruled out satellite.

With most other options ruled out on the grounds of cost or technical problems, a 4 X 2Mbps microwave-based system looked the most attractive. In fact a cost comparison between the existing network and solutions based on 2Mbps Megalinks or microwave links clearly showed the microwave option to be the least expensive.

However, there was some scepticism when the microwave possibility was first suggested because of earlier advice proffered to SAIT on the technology's suitability and line-of-site problems. But an examination of the options (including the judicious placement of a repeater between The Levels and Underdale campuses) proved that a new microwave network centred around the Underdale campus was feasible. The TSC concurred, and microwave became the preferred inter-campus carrier platform.

This left Whyalla and the connection between the Kintore Avenue offices and the main City campus. These latter premises are on opposite sides of a city block, separated by the main campus of the University of Adelaide. The distance involved is less than 500 metres, so under the 500 metre rule the university was permitted to cable between the two premises.

Fortunately, the SAIT had installed data cabling to the Kintore Avenue IT facility. This was the same cable which had provided the old College with its AARNet connection point, prior to the merger. Baseband modems could be utilised to provide a 2Mbps link between the City and the Kintore Avenue PABX rooms. The same cabling is also used to provide a 10Mbps Ethernet link and, with the permission of AARNet, a pair of fibres in the bundle were patched through in the University of Adelaide, to a pair of fibres on the old Institute's AARNet fibre link. This now allows the Kintore Avenue facility (also known as the Schulz Building) to be an equal participant in the university network, without the various protocol restrictions placed on connections which go through AARNet routers.

Whyalla could only be connected with carrier-provided services. A 2Mbps link was not warranted but some flexibility as to the

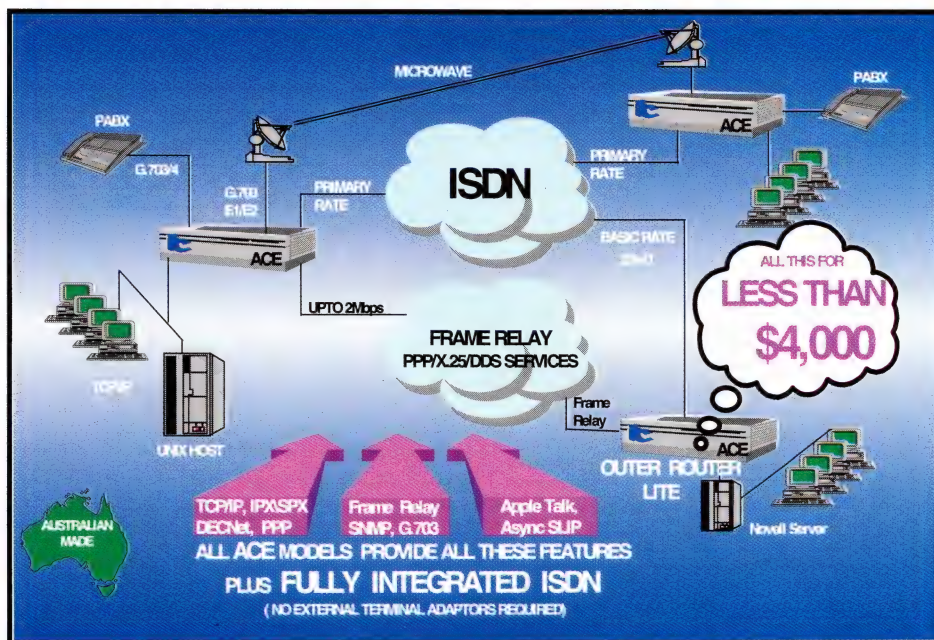


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## Migrating the Data Networks

The challenge in constructing the new University of South Australia's data network from the legacy systems of its SAIT and SACAE antecedents was twofold:

- The new network had to cater for future high-speed requirements; and
- It had to be implemented in a way which minimised disturbances to existing critical applications.

The decision to implement an inter-campus 4 x 2Mbps microwave backbone included the allocation of 4Mbps for voice traffic and 2Mbps for data with the additional 2Mbps capacity available for either purpose on demand. It was widely felt that this capacity was adequate for most foreseeable needs so the major challenge became one of managing migration to the new network.

A crucial early decision was made to terminate data links at each campus at synchronous ports on Wellfleet routers. The Underdale router, which acts as the hub of the network, has 3 synchronous ports running at 2Mbps, one running at 64Kbps and an Ethernet port for the Underdale Campus network. At Whyalla, where data is switched via the Ericsson MD110 PABXs, it is not currently possible to deliver 2B+D ISDN channels to the desktop. However, the MD110 does allow connection of high-speed terminal adaptors to provide a 64Kbps data pipe. Two of these TAs with V.35 interfaces are used to connect routers to the PABX data path. The high cost of channel aggregation devices led to a decision to undertake channel aggregation inside the routers.

A strategy to bridge all DECnet-based traffic through the routers was put in place as the best method of keeping existing IP

and DECnet connectivity intact. The main problem was that the new network topology connected the campuses in such a way that part of the old SACAE's class B address space (at the Kintore Avenue building) would be separated from the rest of the SACAE's IP subnets by the SAIT's IP space. IP routing protocols in use at the time required that IP subnets of a class B space be connected together without intervening IP subnets from other class B spaces. We may have been able to fix this by renumbering the Kintore Avenue building into the SAIT's class B space but it contained an Administrative system which could only support 8/8 subnetting (the SAIT used 6/10), and the primary Domain Name System (DNS) for the SACAE was based in Kintore Avenue and was known to many end user systems by its IP address.

While it was recognised that some renumbering would eventually have to take place in parts of the university, it was seen as prudent to avoid that complication while trying to get the data network links in place.

The short term solution to the IP problem was to use VAXs and IP tunnelling through DECnet to provide logical connections between the stranded Kintore Avenue IP subnet and the remainder of its IP space.

### Legacy Systems

The new University Library System was the first major system which required the new data network to be operational. A new Unix-based minicomputer was purchased and initially located at Underdale so that the old Underdale Library System could be converted first. All interactive access to

the new system was through Telnet via workstations connected directly to the network, or existing dumb terminals connected to Annex terminal servers. Later, the Library System was physically moved to the main Levels Computer Room. This transition was reasonably straightforward, because we ensured that any workstation which connected to the Library System used its DNS entry and did a nameserver lookup to find the IP address. When the Library System was moved, we changed its own IP information and its DNS entry so that the end-users were not aware that it had moved.

Making use of the legacy Wang and Hewlett-Packard HP 3000 minicomputers running the Administrative systems was more problematical because their limited TCP/IP support severely restricted their ability to exploit the new campus network. As a consequence, the Wangs at each site were connected via Terminal Adaptors (TAs) attached to the MD110 PABXs. Each Wang's serial port is connected to a TA which is hot-wired to a corresponding TA at the remote site. TAs were also used to connect existing pairs of terminal multiplexers, such as those used on the HP 3000.

Even though most access to the Wang Administrative System is via dumb terminals, some Telnet network access to the City campus Wang is available via an Annex terminal server. The HP 3000 provides slightly better Telnet access although it is done through an HP proprietary box on the network which converts Telnet sessions to HP's proprietary network terminal protocol.

**Stephen Stone**

size of the route was highly desirable. ISDN semi-permanent connections offered the ideal solution and gave the further bonus that they could be used to support 64Kbps data switched via the PABXs to provide the initial data connection to the Whyalla campus.

All microwave tenderers were made aware of a potential problem between The Levels and Salisbury. Whilst the line of sight was clear, it was straight across the middle of the main runway at Parafield aerodrome, Adelaide's second airport and main pilot training venue. Disruptions to the signal were thus a possibility, and tenders were made aware that the successful microwave bidder would be required to provide a temporary installation and conduct Bit Error Rate tests to assess disturbances caused by aircraft.

Testing by Telecom Australia, the eventual microwave supplier, of The Levels-Salisbury path went error free for a week once

an initial error problem was tracked to the stability of the temporary antenna mounts in gusty wind.

Observations of flight paths actually revealed that as the microwave beam passed almost over the centre of the runway, inclined upwards to Salisbury at approximately 15°, aircraft approaching or leaving the runway tended to be below the beam. Telecom supplied NEC Pasolink systems.

### ISDN to the World

With microwave selected for the inter-campus backbone, ISDN soon emerged as the favourite technology for incoming and outgoing STD voice traffic. A key point in its favour was that Telecom could provide a unique ISDN number range to cover (almost) the entire metropolitan area while conventional indial would enforce different exchange prefixes. Additionally, ISDN indial services were cheaper to install, and, at

that time, provided approximately 10% cheaper long distance calls. Calculations indicated 120 channels would be required to provide indial capacity to the initial network of 3,500 extensions.

During the early discussions Telecom pointed out that Salisbury campus was in an adjacent call charge zone and therefore could not share a number range in common with the other urban campuses. If it was to be served directly by ISDN then a different prefix would be required. In order to keep the common number range, it was decided to utilise The Levels PABX as a transit switching node and switch Salisbury incoming calls over the proposed inter-campus links.

Assessment of the PABX solutions on offer involved a comprehensive technical comparison of all tenders. Networking aspects in particular were checked and double checked. For example, was the operation of



call forward to another campus the same as to a local extension? What happens if a call is transferred via the inter-site links to another campus, then transferred back — does 'trombone trunking' occur or is the PABX intelligent enough to recognise the 'loop-back,' release the tie-lines and re-switch as an internal call?

Prices were also carefully evaluated. Extreme care was taken to ensure each purchase price was on a strictly 'apples-for-apples' basis. Having obtained a 'normalised' purchase price, a whole-of-life cost was determined by costing in three expansions, (based upon equipment prices submitted with the tenders) and annual maintenance costs.

This exercise totally altered the competitiveness of the various offers from the original purchase prices, and highlighted an apparent strategy by some vendors to 'buy' the contract with a low purchase price; and then make up for it with high expansion and maintenance costs once the contract was signed and the customer locked in.

Ericsson Australia, with a proposed network of MD110 PABXs, emerged as the successful supplier after what was a fairly rigorous exercise.

The ability of the MD110 PABX system to support remote cabinets (Line Interface

Modules, or LIMs) also matched the TSC's requirements with regard to the Salisbury campus. By linking two remote LIMs to The Levels PABX, Salisbury could share a number range in common with the other urban campuses. Likewise, the Kintore Avenue building was serviced as a remote LIM on the City. Another remote LIM in the City located in a building on the northern campus perimeter eliminated the need for major cabling upgrades.

## An Easy Growth Path

The eventual decision to select Ericsson MD110 PABXs has greatly reduced the problems of growth for the university. New buildings, which in the past would have necessitated expensive and inconvenient cable and MDF/IDF upgrades can now be developed with a remote LIMs connected by the same fibre optic cables which provide local and wide area network connections. Two such developments have occurred since network cutover, and three more are in various stages of development.

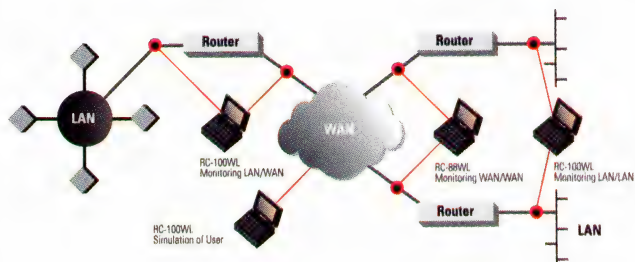
The first site was a building located in Hindmarsh Square near the City campus where a remote LIM linked via 2Mbps microwave was installed. Using terminal adaptors to provide a 64Kbps link, this LIM also provides a 64Kbps link between the main

City router and a Wellfleet Access Node router at the new location.

During the past three years, a new significant city-based site called City West has been purchased in the north west corner of the city centre and new building projects have also been undertaken on some of the campuses. Some of these buildings have been quite remote from the main part of the campus, so fibre optic cabling has been used to provide both voice and data connectivity back to the main network. Typically, a pair of fibres in the bundle will be patched back to the main PABX room so that a new remote LIM can be connected back to the parent PABX. This provides 30 voice channels, internal to the PABX. In addition, a second pair of fibres is patched back to a data network hub. This is often a router, although we do not currently have the luxury of dedicating a router Ethernet port per building. The quantity and type of fibres in the bundle are such that it will be possible to move to either FDDI or perhaps ATM in future, for the campus-based backbones.

Another external site is Techsearch (the university's external consulting arm) where a standard Telecom ISDN Microlink and V.35 terminal adaptor link into an Access Node via a semi-permanent circuit to the City Campus.

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There have been some areas where the data network has been used to complement the voice network. One example is the connection of the Call Accounting and Directory System (CADS) to the data network to provide remote access via Telnet and FTP (File Transfer Protocol). The CADS system collects data from the PABX relating to call accounting. The data network access allows administrative staff to connect remotely to the CADS system, initiate a report, then later download the report to their workstation using FTP. Another example is the connection of the CallXPress Voice Mail system to the LAN so that it can be backed up to a tape drive on another site. The CallXPress Voice Mail system also has a module to provide LAN-based access to users' voice mail boxes. The university is still evaluating the need for this product.

The three universities in South Australia are actively looking at ways to exploit emerging ATM technology. There are proposals to provide very high-speed data pipes between ATM switches based at 3 major locations around the city. This data highway could potentially provide enough bandwidth for high-speed LAN interconnection, voice interconnection and videoconferencing between the major universities, TAFE colleges and the Multi-Function Polis Australia sites.

Investigations are currently under way to determine how such pipes can be built, and what the carriers have to offer.

### Complementary Networks

Despite some hiccups along the way, the creation of a new communications infrastructure within the constraints of a stringent budget to serve the University of South Australia has proceeded fairly smoothly. The voice and data requirements of the network have never really competed — instead they seem to have complemented each other quite well. As currently configured, the university has 60 tie-lines (4Mbps) between each metropolitan campus, and 2Mbps of capacity devoted to data. There is still an unused 2Mbps share of the metropolitan microwave links, which can be potentially used by either voice or data — depending upon where the need becomes most urgent.

Hindsight is indeed a wonderful asset, and the only major network 'flaw' is now apparent. There was a conscious decision during network planning to minimise any phone extension number changes. To this end existing four digit extension numbers were retained.

However, subsequent growth has exceeded expectations and further growth must be planned for, so using only four digits is

no longer feasible, and a conversion program to a five digit scheme was implemented in late August. The cutover went smoothly, despite extensive changes to the PABX, voice mail and CADS systems.

Cost-wise a budget estimate for six PABXs, totalling 2,500 extensions (which eventually blew out to 4,000 extensions), was proposed at \$931,000 in 1990. The microwave network was never budgeted for, but could be — and has been — justified on the ongoing savings available. The then recurrent network costs of \$125,000 p.a. were 'transferable' to the new network budget. So too were monies available for the data network which were transferable to a microwave budget. Funds have yet to be made available to build redundancy into the data network and if a microwave link fails, so do inter-campus data links. The voice network is more resilient because the five campuses with ISDN Macrolink connections can dial around a failed microwave bearer.

In total, the new PABX and microwave networks were implemented for an overall budget of approximately \$1,300,000.

*Don McKellar is a Senior Consultant for Consultant. Stephen Stone is a microcomputer and network specialist at the University of South Australia. Both are based in Adelaide (SA).*

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# The Resale Revolution Rolls On

Price discount wars are hotting up in the volatile resale industry. As some resellers struggle for survival, others have shifted gear into higher value growth strategies.

The revolution in telecommunications service provision inspired by the reforms embodied in the *Telecommunications Act, 1991*, has now well and truly taken hold. In a relatively short time a substantial new industry in resale and service provision has blossomed from a tentative early start (see 'The Resale Revolution' in the March 1993 edition for a description of the early progress made by resellers). The boom, which is leading to lower communications costs for those smart enough to cash in, has been encouraged by Vodafone and accepted by Telecom and Optus, who are now actively courting resellers.

Vodafone has built its entire marketing strategy around resellers. As a carrier, Vodafone is strictly a network operator and wholesaler of air time. Its service providers are the exclusive retailers of its GSM-based capabilities. Optus and Telecom have also recognised that service providers have become a significant force in the industry and developed strategies to deal with the new players. Both have made a careful assessment of reseller roles and created separate internal management groups to deal with them. Officially, the two general carriers welcome service providers as valued customers. But in their more candid moments, the representatives of both carriers admit that resellers are not like other customers, conceding that, in some parts of their organisations, there is a hard core, unrepentant view that any reseller is more a competitor than a customer.

## Different Carrier Approaches

So the decision to create separate responsibility areas for service providers is to some extent a pragmatic response by the main carriers. They need to find an effective way to attract and manage the resellers' business in order to retain the traffic they have under contract. Neither carrier wants to risk alienating service providers, since to do so could cause a wholesale transfer of business traffic from one carrier's network to the other's. Yet at the same time, both carriers are actively marketing their services to the resellers' customers and sales prospects, through other arms of their organisation.

It's a difficult juggling act, but so far Optus and Telecom seem to have succeeded. Still, there are some notable differences in their approach.

For example, Telecom has appointed John Losco as its National General Manager, Service Providers — a group comprising 28 people with about another 50 involved in various support roles. By contrast, Bill Mountford, Optus's Resale Channel Manager, has far fewer staff directly supporting him in his marketing role.



Telecom also has a very extensive range of products available to resellers including VPN, ISDN and other networks that Optus is yet to develop. Telecom is also clearly dominant in the local loop and customer access. Conversely, some resellers (e.g. AAP Telecommunications and Q-Net) have used domestic satellite links provided by Optus as part of their service. Optus has also established service providers closely aligned to its core business; for example, First Direct, a digital cellular service provider using Optus' GSM network.



## Not Everyone Wants Something Extra From ATUG

Industry associations have been quick to respond to the opportunities presented by telecommunications reform. About 80 industry bodies have signed up with carriers or resellers to obtain telephone discounts for their members. Telecom has about 50 directly connected, including the National Farmers Federation, while Pacific Star is understood to have captured some local government associations and Axicorp sells to the Real Estate Institute of Queensland and the Housing Industry Association.

Moves by the Australian Telecommunications Users Group (ATUG) to establish a scheme for its members have generated strong feelings among resellers. One went so far as to describe ATUG's decision to offer the service as "an act of treason." Several weeks ago, members of SPAN (Service Providers Action Network) passed a motion objecting to ATUG Extra, the user group's new telephone discount plan and the cause of resellers' concern. Present at the meeting, representatives of AAP Telecommunications, TelePacific, BT Australasia and SingCom were all critical of the scheme and of ATUG for developing it. Among them, only SITA, the global airline giant, was prepared to voice any dissension to the motion admonishing ATUG.

There is no doubt that ATUG Extra is a significant initiative for the industry association, taking it in a new direction. Yet ATUG plays down the extent of its innovation in providing this service. The basic thrust of ATUG Extra, it says, is to offer a service to members. ATUG considers that it needs to provide tangible benefits to encourage its members to remain financially active.

But critics contend that by making possible the provision of discounted telecommunications services to its membership, ATUG has become a de facto service provider. ATUG, it is alleged, has compromised its position as a champion of telecom-

munications users and has become instead a telecommunications supplier.

Not surprisingly, ATUG categorically denies these charges, saying it is not a service provider at all.

### Strength in Numbers

According to Richard Allen, ATUG's Deputy Executive Director, ATUG Extra customers retain their direct relationship with the carrier or service provider offering the service. ATUG simply introduces its members to the carriers. It's role, he says, has been purely as a negotiator, harnessing the buying power of its members to achieve bigger discounts than may otherwise be available to them, were they to buy as individuals. ATUG denies the charge of treason, but is acutely aware of the disquiet ATUG Extra has caused with some of its members and resellers.

The publicly stated reason for opposition to ATUG Extra is ATUG's special role as a consumer body. But it is unlikely that service providers would be so concerned if ATUG was a smaller and less influential organisation. ATUG has nearly 700 members ranging from single person consultancies to major corporations. This membership is skewed towards organisations involved with the telecommunications industry — including some very large users of telecommunications services. Around 20% of the Top 100, 300 and 500 companies are members.

Richard Allen estimates that the total spend by ATUG members on telecommunications services is in the order of \$1.5 to \$2 billion annually. At least half that (\$1 billion) could be spent on ATUG Extra. That is merely its potential. Shortly after it was launched, the high yielding long distance service produced billings in the order of \$350,000 for the month, although it is believed that total traffic volumes are grow-

ing strongly. In comparison, AAPT's revenues last year were about \$42 million.

ATUG's moves to create ATUG Extra were widely known in the industry, well before the service was launched. The Board agreed to establish the service in late 1992 and by the middle of last year a detailed tender was prepared by consultants Amos Aked Swift to allow carriers and service providers to bid as vendors for one or more of the services on offer. In the event, two resellers, Network Exchange (Netex) and Vodac, were selected for some of the services. The tender is renewable every year with the next round due to begin in the second quarter next year.

Netex is a switchless reseller and provides a range of Telecom-based services to ATUG Extra including local calls, line rental, '1-800' and '13' calls and telecard services. Vodac is a Vodafone service provider, wholly-owned by the carrier, offering discounts to ATUG Extra users above corporate air time rates for digital cellular services.

The most commercially significant portion of the ATUG Extra tender was won by Optus. Optus agreed to supply ATUG members with a minimum of 19% off their published prices for long distance calls. ATUG says this gives a total saving of 'at least 25%' compared with Telecom's prices for comparable services. Optus also offers discounts on digital leased lines and corporate rates on analogue cellular connection. The industry association calculates that the savings for its members will range from several hundred dollars a year for a one person professional office to tens of thousands for some larger organisations. According to ATUG, it is 'taking a small fee' to administer the scheme.

However, many service providers seem concerned that ATUG Extra's success may be at their expense. MIG, for example, was established in 1991 and was the first resell-

Optus has had discussions with the full range of service providers, but states it is not looking to cover the whole market. Rather, its emphasis is on a small number of select relationships. Optus is looking for service providers with a 'value proposition' where the sales plan is not just based on price but on a longer term strategy that will ideally complement the marketing efforts of the carrier. Bill Mountford states emphatically that Optus is not interested in being a wholesaler of bandwidth. They will look seriously at small operators. In contrast, Telecom is more aggressively attacking the market as a whole and is looking to retain as much of the service provider traffic as possible.

Both carriers have put a lot of effort into developing price plans with attractive dis-

counts for service providers (and others). But a fundamental difference is that, as a dominant carrier, Telecom Australia must charge strictly in line with its published prices, while Optus has greater latitude to negotiate special deals.

John Losco emphasises the 'Chinese Walls' within Telecom to reinforce his message that the customer/competitor identities of service providers are clearly separated. As well as forming an independent group to take account management responsibility for service providers, Losco takes considerable care to explain the integrity of Telecom's company wide data management practices, whereby Telecom's retail sales force is denied all access to a reseller's confidential customer information

Bill Mountford says that Optus' decision to create a resale sales force was an evolutionary development with the carrier responding to a market push. Since the legitimacy of service providers was not at issue, the key issue for Optus was in utilising service providers as an alternative distribution channel to the market.

The first Optus appointed service provider was NSO Telecommunications, a switchless reseller of long distance and international voice services. According to Managing Director, Russell Fox, 'NSO Telecommunications is treated as a major customer by Optus and is not seen as a threat.' This is understandable, since NSO has connected all its customers through Optus and competes aggressively with Tele-



er to enrol under Austel's International Service Providers Class Licence.

The company has offered international switched and dedicated calls with a special focus on the residential market and ethnic communities, in addition to business users. MIG is currently 'under administration' and according to Managing Director, Ivan Gonzalez, is trading its way out of difficulty. Mr Gonzalez has been quick to point out that resellers can only succeed if they establish a reasonable volume of traffic and scale of operations. He believes that declining margins and the widespread availability of cheap calls make it imperative for service providers to add value through innovation, if they are to remain in business.

## Competition in Action

It's important to note that not all resellers have condemned ATUG Extra and some are even directly involved in it. Alan Sangster from Netex considers his company's involvement of real benefit, both from the kudos in having been selected and in the financial gain as a participant. Nevertheless, while ATUG insists strongly that it remains resolutely 'pro choice' in telecommunications services, many resellers consider that ATUG Extra should simply be aborted.

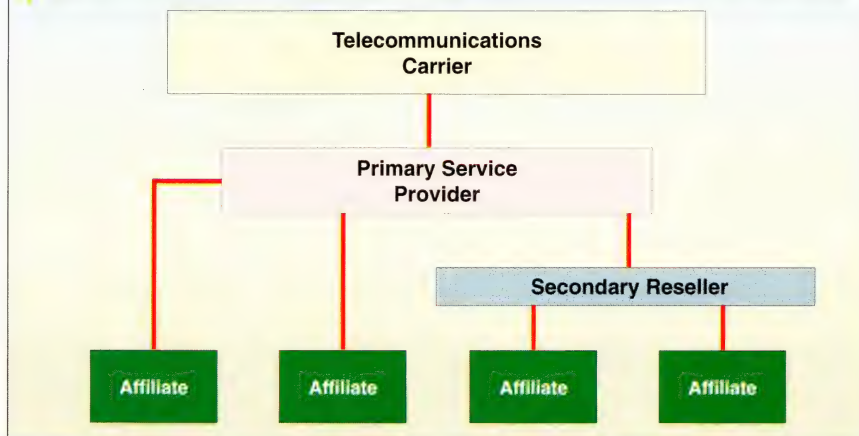
Whether intended or not, the outcome of ATUG's tendering process has produced an interesting testament to the state of competition in telecommunications service delivery. For ATUG Extra utilises services from all three carriers (Telecom, Optus and Vodafone) and at the same time finds a constructive role for two service providers. It's an almost too perfect, text book outcome for an industry association wanting to prove it is 'politically correct' in its even-handedness and balance.

**Mark McDonnell**

com on price. NSO Telecommunications uses Telecom's hourly fax and bulletin board services to keep abreast of the dominant carrier's price movements. It aims to be cheaper than any of Telecom's Flexi-Plans or other published rates, knowing that the *Telecommunications Act* requires Telecom to charge strictly in accordance with its filed tariffs. So NSO's customers are all quoted a price at an individually negotiated discount to Telecom's published price, whatever that might happen to be. With a staff of only seven, but with 150 sales agents selling on commission, the reseller's marketing expenses are well below the carriers' cost of sales.

For its part, Optus has already had a significant effect on the resale market in ways that may not have been fully intended.

**Figure 1: Resale Supplier Hierarchy**



Acting as a leading supplier to ATUG Extra is only one example. Just as importantly, Optus' legal action against Telecom over the Strategic Partnership Agreements (SPAs) has had a direct impact on some of the larger service providers. According to SPAN's Chairman, Brian Perkins, AAPT, Axicorp, BT Australasia and Pacific Star had all signed up with Telecom as SPA participants. Now those agreements have come unstuck, each company must negotiate a replacement package of services under new terms and conditions.

Both carriers continue to develop price plans to sharpen their competitive edge. Optus provides leased lines to resellers, some satellite links (although there has been some contention over the supply of trans-Tasman capacity) and a volume-based long distance telephony service. Bill Mountford outlined a proposed new Optus scheme that will offer service providers an increasing level of discount as their total traffic increases. These discounts are to operate in specific distance bands.

Telecom has also devised new price plans with an accent on 'total service solutions.' John Losco says Telecom's policy is to establish a hefty margin between its new price plans and existing retail products such as STD and IDD. Telecom is extensively revising its pricing and product offerings and while some changes have already been implemented, more are to follow. CustomNet Horizon, for example, expires at the end of June next year and is to be replaced with a new virtual private network (VPN). International Call Plan, often used by resellers in conjunction with Horizon, has already had a new tariff filed, based on an amended volume discount scale.

Other price plans being withdrawn by Telecom include the ill-fated SPAs, corporate Flexi-Plans 1 and 2 and the DDS Long Term Agreement. The new plans all have fees and the discounts take effect from the first dollar spent. Service providers and other customers using these plans can opt

out at any time, including the first twelve months. The table on page 94 summarises some of the features of the new price plans.

## Hierarchies and Interrelationships

Changing carrier price plans, product offerings and resale management practices are only one source of volatility for service providers. One of the more fascinating developments in the resale market over the past 18 months has been the growth in the number of resellers in general, and switchless resellers in particular. Many of the emerging service providers are small local companies using the carriers' standard products for large volume users as the basis of their business.

A company like Call Australia, for example, employs 20 people at its main office in Sydney and is represented interstate by locally-based affiliates. Call Australia uses both Telecom and Optus services, including Telecom's CustomNet Horizon, a multi-site virtual private network service. A key feature of Horizon, like other volume-based discount plans, is that the more on-net traffic carried for the customer, the greater the savings on each call.

Call Australia, among others, has reacted sensibly to this arrangement, by aggregating its traffic with that of a larger Horizon reseller, Netex. Netex was one of the first service providers to establish a business based on Horizon, and its customers, too, benefit directly from the growth in total traffic carried. So Call Australia has established its connection to Horizon via Netex, rather than directly with Telecom, producing higher discounts for both resellers and their customers. It looks like a good example of a 'win/win' business strategy.

Call Australia is not an isolated case. Alan Sangster at Netex says he has 'lots and lots' of service providers on-selling his service, thereby creating an extended indirect sales force. He says there are between 80 and 100 people selling differently branded



services connected via Netex, compared with only 15 people on his payroll.

Other established resellers are also using the leverage of their existing customer base and their agreements with the carriers for network connection, to extend their market reach. AAPT for instance has appointed Bell Horizon in Melbourne as a reseller of its services.

The most pertinent observation to make about this arrangement is that the switchless resale market has developed its own hierarchy, based on a three tier structure:

- 'Primary' service providers with direct account relationships with the carrier;
- 'Secondary' resellers, utilising carrier services sourced from a primary service provider; and
- Affiliates, operating as separate businesses under a local distribution agreement with either a primary or secondary reseller.

Figure 1 on page 93 presents this structure. Of course, describing this pattern as a 'structure' is a little too rigid. These arrangements should be seen as cooperative marketing ventures with a good deal of fluidity and open endedness. Secondary resellers may, for example, have direct carrier relationships for some services and rely on another service provider for only some of its 'customer solutions.'

Yet there is a degree of interdependence in sections of the resale market that go far beyond the issues of facility sharing and network interconnection. The multi-tiered approach to resale extends the reach of service providers into new markets. It also allows a variety of approaches in marketing what are essentially the same services. Variations can occur in areas such as fixed versus flexible discount levels, on-going engineering support and the location of marketing operations. It's different strokes for different folks.

## Foreign Carrier Entry

At the other end of the service provider spectrum are the international operators. These days, if you're dealing with a service provider, chances are it's the subsidiary or joint venture partner of a foreign telephone company.

These operators are not only larger and better funded than the locally grown breed of service providers but tend to operate on a more sophisticated basis. Generally speaking, you won't find an international operator setting up in Australia as a switchless reseller. International resellers are occasionally involved in resale of basic telecommunications services, but are more likely to be involved in supplying enhanced services, including fax store and forward, EDI and messaging services and facilities management. A few examples will illustrate the trend.

Let's start with AAPT, a company not usually considered as an international oper-

Telecom's New Price Plans				
NAME	CODE	FOR	DISCOUNT	SPEND LEVEL
Call Saver 8	CS8	Long distance	Up to 25%	\$100,000/month
Multi Site Plan 1	MSP1	Local calls and access	1% - 16.5%	\$15,000/month
Net Plan 1	NP1	Digital data service	4% - 18%	\$150,000 pa.
Net Plan 2	NP2	Analogue and digital leases	4% - 10%	\$300,000 pa.
Net Plan 3	NP3	Media audio and video services	3% - 6%	\$200,000 pa.
PacPlan		Austpac dedicated access	1% - 20%	n.a.

Source: Telecom Australia

ator, but having a substantial equity investment from MCI, the second largest long distance carrier in the US. AAPT's Chief Operating Officer, Larry Williams, is a former MCI executive. AAPT has developed services such as Vantage (closely modelled on MCI's VNET service), its billing system is based on MCI's facility in Iowa and it has sourced switches from MCI's major supplier, DSC.

MCI's two major domestic competitors are also active in Australia. AT&T has been operating here for several years, through separate businesses offering PABX and voice processing systems, customer cabling and AT&T's international services. In the past year it has become active as a local service provider through AT&T Easylink Services. This company offers messaging services based on a common platform, with e-mail, EDI and enhanced fax. Its position in the local market was strengthened via a joint venture with Paxus and Qantek, with AT&T subsequently acquiring the parts of Paxus' operations relevant to its business e.g. Healthgate.

Sprint is managed in Australia by Trevor Duff, once an OTC executive but for the past five years responsible for Sprint's business operations locally and regionally. This involves supporting the long distance carrier's international private line, VPN, toll free and country direct services and working with Telstra Enhanced Services as the local distributor of SprintNet and Sprint's global frame relay service. While currently employing only six people in Australia, Sprint has recently advertised a range of management positions covering operations, marketing, sales, finance and customer service. The company plans to launch new business services in Australia and New Zealand in the next six months operating under Austel's International Service Providers Class Licence and targeting the business sector. It will have offices in Sydney, Melbourne and Auckland.

BT Australasia has been operating here since the 1980s and has become significant locally as manager of the NSW Government network. In this role it is both a facilities manager and network services provider, connecting over 5,000 sites, 120,000 telephones, and 23,000 computer terminals in over 140 agencies and departments. BT's investment in developing a private network for the government has been projected at up to \$1 billion over its ten year contract period. The British carrier is also pursuing large corporate customers in Australia for its services, including EDI, videoconferencing and frame relay.

Pacific Star is owned by Bell Atlantic and Telecom New Zealand and manages the Queensland State Government network through its subsidiary, SunNet. With State Government outlays on telecommunications of around \$100 million annually, Pacific Star has a prime objective of reducing that cost through better network management. Some sizeable efficiency gains have been achieved simply through a more centralised approach, such as a large reduction in the number of bills that must be paid. Pacific Star employs 70 people full time with another 60 on a contract basis.

SingCom is a wholly owned subsidiary of Singapore Telecom and has established a business in Australia based on fax store and forward, packet switching and leased lines. It too has made a multi-million dollar investment in hardware and facilities to support its services. Like AT&T, SingCom took over a locally-based company, InfoLink, to secure its position in Australia. Like Sprint, SingCom has attracted an experienced OTC executive, Richard Vincent, as its leader.

## The Quest for Value

But several examples, briefly profiled, no doubt fails to convey the full impact of foreign carrier entry into Australia. So it may be more helpful to look in a little more



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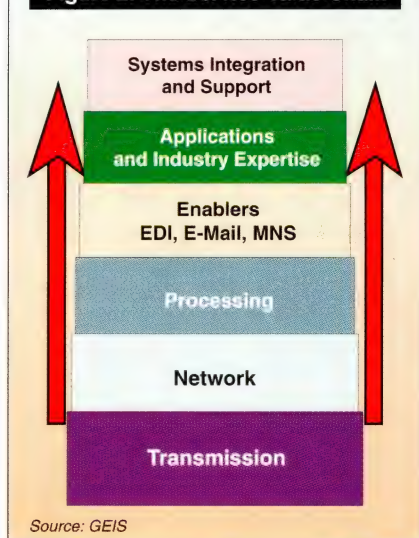
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**Figure 2: The Service Value Chain**


detail at the global strategies and local impacts of just one foreign telco, Ameritech.

The US RBOC has recently completed a radical restructuring and now sees its role not as a carrier, but in terms of 'the movement and management of information.' Richard Notebaert, Ameritech's President and CEO puts it this way: 'Management to us is the acquisition, the creation and the packaging of information, as well as the movement. We aren't just a pipe, just moving it along the information highway... We will create content, moving up that food chain, or the 'customer needs' chain, from the transportation layer into the information layer or content layer.'

In Australia, Ameritech is active not only through its part ownership of Pacific Star (via Telecom New Zealand), but through its acquisition in May this year of 30% of the equity in GE Information Services, exercisable through a four year convertible note issue. GEIS has emerged as a major supplier of value added services and its customers include BHP Steel, Mobil Oil and key retailers such as Coles Myer, Lowes, Brashs, and their suppliers, Kambrook, Breville etc.

GEIS has developed its customer base by building its business on a 'hub and spokes' strategy by following existing trading patterns between the companies involved.

GEIS's approach to service provision has been to develop customer applications using generic technologies such as EDI and messaging. A recent example is AEROS, an electronic catalogue and ordering system designed for the Australian Record Industry Association. Launched in February, it was installed in over 330 music stores three months later.

Under its Managing Director Australia New Zealand, Duncan Black, GEIS has also placed strong emphasis on the service value chain in the reconstructed communications/information marketplace. Figure 2 illustrates the GEIS view of market development, following the path to increased value. As Duncan Black sees it GEIS is 'a systems integrator of electronic commerce services.' The growth potential in this market is immense. As Black relates 'we talk about this industry as if it's mature. The reality is a vast array of documents are yet to be traded as electronic commerce.'

GEIS is not alone in seeing increased value in systems integration and facilities management. According to marketing consultant Paul Budde, the current facilities management market in Australia is around \$200 million, and he predicts that next year it will grow to \$500 million.

TSB International is another company that exemplifies the success that a small, young company can enjoy by following a well developed value added strategy. TSB started in Canada in 1981 as a manufacturer of call collectors for PABXs. It still operates in that sector, with an expanded product range, but more recently has moved into services and into the international marketplace, including Australia.

Its revenues last year were over \$C21 million, an annual increase of 28%. Net income was \$C4.3 million. Facilities management has been an important source of growth for the company, contributing a quarter of total revenues worldwide last year. Aust-

ralian Managing Director, David Turik, sees that contribution continuing to grow and estimates that current FM contracts are valued at around \$13 million, compared with only \$200,000 three years ago.

TSB works with large carriers and big business. In Australia its customers include Vistel, ICI, DEC, Austrade, the Australian Stock Exchange and the St George Bank. It works closely with Telecom, having helped to establish Telecom's subsidiary, Advanced Network Management. This relationship has been fostered over several years. In 1993, for example, TSB acquired the OTC company Navigator Communications. Similarly, in Europe and North America, TSB works as a specialist provider to dominant carriers, including BT. TSB provides its call collectors and alarm monitors for the NSW government network, managed by BT Australasia.

The key to growth in this market sector is in offering a series of interrelated services at a price that is below a company's cost of internal supply. This is achieved through a combination of specially developed hardware and software, bureau operations and shared support systems.

While TSB, GEIS and other value added service providers represent role models of sorts, their success lies in a degree of specialisation that most service providers would have difficulty emulating. In large measure, their success has been in finding a niche particularly well suited to their skills and resources. The challenge confronting all service providers is to add value without looking like a 'me too' supplier.

As lateral thinker Edward De Bono remarks, competition is only about survival; success requires going beyond competition to create 'value monopolies.' "Value monopolies," he says "are driven by concepts, and concepts are in turn driven by serious creativity." The resale market today needs seriously creative people.

*Mark McDonnell is the Principal of McDonnell Communications Research and is based in Wilberforce (NSW).*



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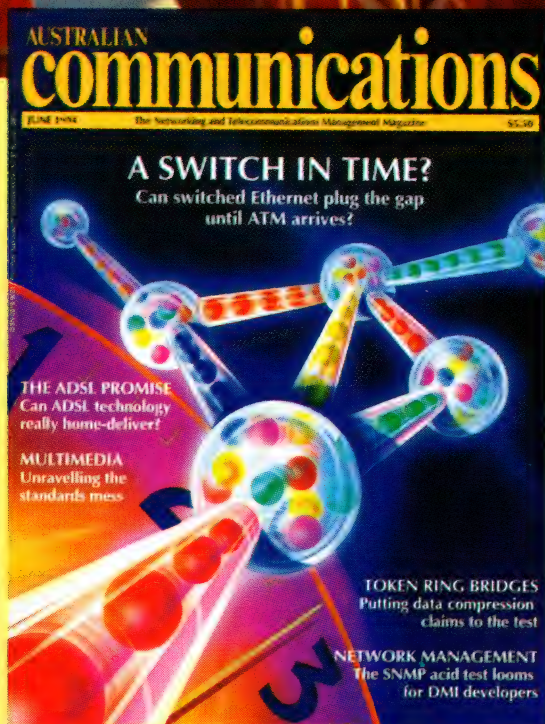
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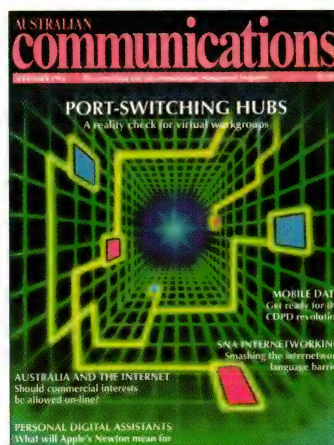
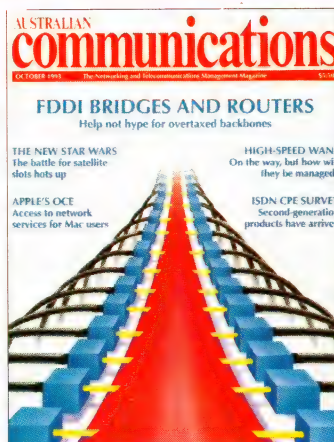
  
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# FDDI Adaptors: A Sure Cure For the Bandwidth Blues

FDDI cards can help straighten out backbones sagging under greater data volumes, and they have one big advantage over other fast technologies — they're available right now.

**W**ith ATM, Fast Ethernet, and 100VG-AnyLAN just on the horizon, most net managers are looking forward to fast times on their LANs and internetworks. But for those who need a high-speed fix right now, there's one already tried-and-true option that's more than capable of delivering the bandwidth goods — Fibre Distributed Data Interface (FDDI).

Granted, at the prices charged for most fibre adaptors, even makers of FDDI cards don't expect FDDI to make it to the desktop sometime soon. But with corporate backbones sagging under the weight of ever-growing volumes of LAN traffic, FDDI, with its 100Mbps of bandwidth, certainly is worth a close look for anyone needing to break chronic bottlenecks in client/server networks.

A close look is exactly what the US-based Data Comm Test Lab has given to some of the networking industry's best and brightest FDDI adaptor cards. In our latest round of tests, we evaluated seven FDDI adaptors — five that run in PCs with EISA buses and two that run in Sbus-based workstations from Sun Microsystems — from five different vendors. All told, we ran more than 2,000 performance tests to get a true read on what users can expect from FDDI adaptors. We also evaluated the cards according to critical issues like the availability of software drivers for different LAN operating systems.

In terms of performance, the news couldn't be much better. All five EISA adaptors we evaluated came through with top aggregate throughputs of more than 90Mbps, with the best of the bunch delivering 98Mbps — just about wire speed for FDDI. Throughput either climbed or held steady as we added clients to our NetWare 4.01 test bed, confirming FDDI's suitability for the server farms now showing up on corporate backbones. The two Sbus adaptors we tested also proved capable of muscling up as network traffic rose — a key consideration in the high-bandwidth world of Unix workstations.

Once all of the results were tallied, weighted, and triple-checked, two cards emerged as best of class. Among EISA adaptors, the Smart 100 EISA Ringnode/FDDI from Madge Networks stood out as the fastest card in most tests we ran. The FDDI Sbus Adaptor-Turbo from Cisco Systems Workgroup Business Unit proved the faster of the two Sbus adaptors we evaluated.

## The Rules of the Game

Anyone who thinks that performance is all that counts when it comes to evaluating FDDI adaptors is almost right. But it doesn't matter how fast a card is if users can't get the software drivers they



need for their installations. In fact, the high-end orientation of the FDDI adaptors we tested belies some surprising and glaring omissions on vendors' driver support lists. These omissions extend even to the world's best-selling local area network operating system, NetWare from Novell.

In using NetWare 4.01 as our test-bed operating system, we uncovered a few such driver gaps. In one case, one card maker's NetWare server driver wouldn't communicate with another vendor's



**Table 1: Selected Vendors of FDDI Adaptors**

VENDOR	PRODUCT	SERVER DRIVER RELEASE	CLIENT DRIVER RELEASE	MAXIMUM FRAME SIZE VERIFIED (BYTES)	AVAILABLE DRIVERS
<b>EISA CARDS</b>					
<b>Cisco Systems</b> (02) 957 4944	CDDI/FDDI EISA-PC Adaptor	1.2	1.2	4,466	NetWare 3.X, 4.X for DOS; Windows NT; HP-UX, Silicon Graphics Irix; NDIS 2.01 (LAN Manager, Windows for Workgroups, Sun PC-NFS)
<b>IBM</b> 13 24 26	FDDI Fibre Base EISA Adaptor	3.00a	1.25	4,466	NetWare 3.X and 4.X for DOS and OS/2; LAN Server 2.0 and 3.0 for DOS and OS/2; LAN Manager for DOS and OS/2; SCO Unix
<b>Madge Networks</b> DDP (02) 906 1200	Smart 100 AISA Ringnode/FDDI	2.01	2.00	4,178	NetWare 3.X and 4.X for DOS; LAN Server 2.0 and 3.0; LAN Manager 2.X; Windows for Workgroups 3.11
<b>Network Peripherals</b> Com Tech (02) 317 3088	FDDI EISA Fibre	2.0r	2.3k	4,178	NetWare 3.X and 4.X for DOS and OS/2; LAN Manager; Windows NT; NDIS 2.01 (LAN Manager, Windows for Workgroups, Sun PC-NFS)
<b>3Com</b> (02) 959 3020	FDDIlink-UTP and FDDIlink Media Module-F	2.00A	2.00	4,466	NetWare 3.X and 4.X for DOS; LAN Manager; Windows for Workgroups 3.11; LAN Server 3.0; SCO Unix
<b>SBUS CARDS</b>					
<b>Cisco Systems</b> (02) 957 4944	FDDI Sbus Adaptor-Turbo	1.2	1.2	4,096	SunOS 4.1X; Solaris 2.X
<b>Network Peripherals</b> Com Tech (02) 317 3088	NP-SBS-S10 (SAS)	1.7	1.7	4,096	SunOS 4.1X; Solaris 2.X

DAS = Dual Attached Station  
SAS = Single Attached Station

STP = Shielded Twisted Pair  
UTP = Unshielded Twisted Pair

client driver (a situation that the first vendor remedied by supplying a later release of its product). Meanwhile, another vendor had to send us a separate driver for NetWare 4.X, even though Novell's 'enterprise' product has been shipping for more than a year.

The further beyond the mainstream, the spottier driver support becomes. For instance, shops with NetWare clients running under OS/2 are locked out of the top three performers in our EISA tests: Madge's Smart 100 EISA Ringnode/FDDI, Cisco's CDDI/FDDI EISA-PC Adaptor, and the FDDIlink card from 3Com do not come with NetWare drivers for OS/2 clients.

The list of supported NetWare servers and clients looks positively lavish compared with other network operating systems (see Table 1). IBM's LAN Server isn't supported at all by Cisco, 3Com, or Network Peripherals. IBM and 3Com don't offer drivers for Windows NT from Microsoft, and users of EISA-based Unix workstations, such as the Apollo 9000 Model 700 series from Hewlett-Packard, and the Irix from Silicon Graphics, can buy adaptors from exactly one vendor — Cisco.

At well over \$2,000 per single-attached FDDI adaptor, cost also is a concern. While the prospect of plunking down that kind of money for an adaptor can be painful, managers typically are installing them on

backbone networks only. (This is especially the case with EISA products.) It's also worth noting that a single FDDI adaptor delivers higher aggregate performance than a half-dozen Token Ring or 10 Ethernet adaptors for roughly the same price.

Many adaptor vendors now offer FDDI-over-copper cards that cost substantially less than their fibre equivalents. Evaluating these copper versions was beyond the scope of this test, although some informal checks show them to be just as fast as the fibre versions.

The one catch with FDDI-over-copper products at present is that vendors differ enough in their implementations of MLT-3, the FDDI-over-UTP signalling spec, for interoperability to be a cause for concern. However, all manufacturers offer external fibre media converters for their copper cards, and there is absolutely no problem with interoperability if these are used. Adaptor makers also say they are very close to resolving the differences in their MLT-3 implementations.

For installations in which reliability is an overriding concern, adaptor vendors offer dual-attached station (DAS) cards, which attach to both rings in an FDDI network. DAS cards, which cost considerably more than single-attached station (SAS) adaptors, improve reliability by redirecting traffic to

FDDI's secondary ring if the primary ring fails. Of the vendors that submitted adaptors for our tests, only 3Com does not offer a DAS version. Instead, the vendor offers software that links two SAS cards in a single workstation or server. 3Com says its software handles all the necessary information transfers — including MAC (media access control) address changes — in the event of a ring or card failure.

## Measuring Performance

Of course, all other factors being equal, performance remains the central criterion for judging local area network adaptors. And that's exactly what we focused on in our evaluations.

We decided that the best way to find out how fast a given FDDI adaptor runs is to slot that card into a high-end server and then have the server send traffic — lots of traffic — to clients on an FDDI network. In our EISA tests, we started with one client and then added clients one at a time, stopping at eight. Our goal was to produce a performance curve showing exactly how many clients the adaptor could service before throughput levelled off or even declined.

We used a high-bandwidth test application, so that each client on our test bed actually represented five to 10 clients handling real-world traffic. Had we merely



used a crude bit-blaster approach — counting how quickly an adaptor sends frames onto the network — we wouldn't have revealed anything about how adaptors behave when handling real traffic.

We made sure that our test-bed traffic mimicked the real thing on several important fronts. For instance, our methodology specified the use of two-way traffic, since many communications protocols require acknowledgment frames to be sent from a recipient. We also set out to relate performance to the way that FDDI cards are used — which in the EISA world means FDDI backbone networks servicing Ethernet or Token Ring LANs. Even though we tested only on FDDI networks, we devised scoring systems for FDDI-to-Token Ring or FDDI-only networks. Both scoring systems assign weights to different maximum frame sizes relative to their importance on enterprise networks.

## Frames And Windows

The two most critical elements we made sure to include were variable frame sizes and variable window sizes. As we've noted before, for tests like these to be meaningful, traffic has to consist of a variety of frame sizes — including, on internetworks that support them, frames that approach FDDI's theoretical maximum of 4,500 bytes (see 'Token Ring Adaptors Evaluated for the Enterprise,' in the May 1993 edition). Since each frame represents work to be done by an adaptor, larger frame sizes obviously will produce more efficient data transfers. But real-world considerations dictate that many, if not most, frames on a network will be far smaller than the theoretical maximum. Thus, it's critical to measure an adaptor by its ability to handle a range of frame sizes.

Most common communications protocols, including Novell's IPX/SPX, generate a significant amount of overhead — almost all of which comes in small frames roughly 64 to 200 bytes long. Housekeeping tasks like NetWare SAP (Service Advertising Protocol) and RIP (Router Information Protocol) updates guarantee a large number of small frames on the network. And when NetWare 3.11 LANs and routers are involved, the maximum frame size allowed is 576 bytes, unless Novell's Large-Packet IPX (LIPX) driver is loaded.

Applications also cause many small frames to be sent onto the network; a relatively low-bandwidth task — such as a request for a directory listing — generates yet more small frames. NetWare usually negotiates a frame size based on the amount of data involved in any operation; only when a large amount of data is involved, such as in a file transfer, will larger frames appear on the network. Notably, NetWare determines a maximum frame size only once — when a client logs in to the server.

**Table 2: FDDI Time Trials**

	FRAME SIZE (BYTES)				
	64	512	1,024	4,096	Burst Mode
Throughput (Mbps)					
Madge	1.948	7.076	12.784	38.540	87.040
Cisco	1.856	6.900	11.364	24.672	22.720
3Com	1.872	6.548	11.416	22.452	38.524
IBM	1.572	5.928	9.712	20.872*	54.896
Network Peripherals	1.548	5.512	9.028	19.176	76.000

\* Based on 4,097-byte frames

**Table 3: Weighted Winners, FDDI-Ethernet**

	NUMBER OF CLIENTS							
	1	2	3	4	5	6	7	8
Madge	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
3Com	9.7	9.8	9.8	9.9	9.9	9.9	9.8	9.7
Cisco	9.8	9.7	9.7	9.7	9.8	9.8	9.7	9.6
IBM	8.9	9.0	8.8	8.8	8.7	8.3	7.6	7.0
Network Peripherals	8.1	8.2	8.1	8.0	7.9	7.5	6.8	6.3

These are composite scores, assigned by weighting different frame sizes according to their importance. The weightings were: 64-byte frame, 30%; 512-byte frames, 15%; and 1,024-byte frames, 55%

**Table 4: Weighted Winners, FDDI-Token Ring**

	NUMBER OF CLIENTS							
	1	2	3	4	5	6	7	8
Madge	10.0	10.0	10.0	10.0	9.9	9.9	9.8	9.9
3Com	9.0	9.7	9.8	9.9	9.9	9.9	9.8	9.8
Cisco	8.9	9.6	9.8	9.8	9.9	9.8	9.8	9.7
IBM	9.1	9.3	9.4	9.4	9.3	9.0	8.6	8.2
Network Peripherals	8.5	8.8	8.8	8.9	8.6	8.4	8.1	7.8

These are composite scores, assigned by weighting different frame sizes according to their importance. The weightings were: 64-byte frames, 30%; 512-byte frames, 15%; 1,024-byte frames, 10%; 4,096-byte frames, 10%; and Burst Mode traffic, 35%

Frame size also is limited for users of FDDI backbones linked to Ethernet LANs because of the 1,518-byte limit defined in the IEEE Ethernet specification. Even when transferring lots of data between a server on FDDI and a client on Ethernet, the largest frame the two stations will be able to negotiate is only around 1,500 bytes or less for distribution onto Ethernet.

## Bursting Through

NetWare 4.01, our test-bed operating system, also allows stations to negotiate win-

dow size, or the number of frames that can be sent from one station to another before an acknowledgment frame from the receiving station is required. Burst Mode, a feature introduced by Novell with NetWare 4.X, typically allows about eight frames (data packets) to be sent in succession before an acknowledgment must be sent.

It's easy to see the advantages of Burst Mode for handling large file transfers. During our evaluation, we sent 4,096-byte frames between a pair of FDDI EISA Fibre cards from Network Peripherals. When the



**Table 5: Sbus Adaptor Performance, UDP Frames**

	FRAME SIZE			
	64	512	1,024	4,096
Throughput (Mbps)				
Cisco	2.25	12.48	26.61	54.44
Network Peripherals	1.84	11.11	22.65	52.94

**Table 6: Sbus Adaptor Performance, TCP Frames**

	NUMBER OF CLIENTS		
	1	2	3
Throughput (Mbps)			
<b>128-BYTE FRAMES</b>			
Cisco	2.25	12.48	26.61
Network Peripherals	1.84	11.11	22.65
<b>512-BYTE FRAMES</b>			
Cisco	8.77	12.94	13.74
Network Peripherals	8.67	9.91	—
<b>1,024-BYTE FRAMES</b>			
Cisco	21.35	21.72	22.22
Network Peripherals	22.46	10.43	—
<b>4,096-BYTE FRAMES</b>			
Cisco	30.03	30.69	30.52
Network Peripherals	29.31	29.63	—

\* 128-byte frames were used because the TCP header alone is 65-bytes.  
Network Peripherals cards were not tested with three stations.

window size was one — that is, an acknowledgment was required for each data frame — throughput was around 19Mbps. With Burst Mode enabled, throughput quadrupled, to 76Mbps.

Of course, Burst Mode's advantages are relative. For instance, Burst Mode only kicks in when an application is capable of buffering a relatively large amount of data. Many common LAN operations — log-ins, directory requests, short e-mail messages, and the like — always will use small, single data frames. And some older LAN applications do not allow window sizes larger than one, even for file transfers. Burst Mode is important for applications that can use it — but there's still likely to be plenty of traffic on the network that can't take advantage of it.

## Performance Anxiety

In keeping with our real-world approach to test design, we wanted a traffic generator that would give us three things: high output, tight control over traffic patterns, and easily reproducible parameters. Unfortunately, the one package that met all three criteria for our EISA tests — IBM's APPC-based Bader Benchmarks — doesn't work with ODI (Open Data-link Interface), the data-link transport recommended by Novell. That left us with Novell's Perform3 utility, which has

the benefit of widespread recognition but which suffers from some serious shortcomings. For instance, Perform3 doesn't allow control of frame sizes when Burst Mode is enabled; it simply uses the largest frame size it can, up to the maximum frame size defined in NetWare's configuration file (we've noted these sizes in Table 1 on page 100).

Its shortcomings aside, Perform3 is the one program that's widely used and understood by vendors and network managers — all suppliers of EISA FDDI adaptors participating in our tests use Perform3 for their internal testing. We decided to stick with Perform3, but we also rated products in a way that minimises the effect of its shortcomings.

## The EISA Tests

Armed with our caveats, we set out to answer the central question of how fast an FDDI card would run in a NetWare server. Since stressing the server was our goal, we wanted the fastest possible cards in our client stations. To determine which vendor's card ran fastest, we conducted a round of speed trials for each adaptor involved in our EISA test. This involved measuring performance between one server and one client, each equipped with the same vendor's FDDI adaptor. We tested at several different

frame sizes, and also used Burst Mode to evaluate window sizes (see 'Test Methodology' on page 105).

After the dust settled, Madge's Smart 100 EISA Ringnode/FDDI proved to be the fastest adaptor in the first round of tests (see Table 2 on page 101). Its throughput was highest at all four frame sizes, and it was also fastest in the Burst Mode tests. Based on these results, we used Madge cards in all clients for the second round of tests.

For that second round, we had two goals in mind: to find out how much traffic each server adaptor could handle, and to show how many clients the card could service before throughput levelled off. As we ran through the second round of EISA tests, we found that throughput began to level off once the number of connected clients reached five — this was the case for adaptors from IBM and Network Peripherals.

The levelling-off pattern for these adaptors was evident with the smallest frames tested, 64-byte frames, (see Figure 1 on page 104). That pattern also held true for 512-byte frames and 1,024-byte frames (see Figures 2 and 3 on page 104). Performance curves for the other three vendors in the EISA test — Cisco, Madge, and 3Com — continued upward for these frame sizes even after we reached the maximum number of clients (eight) in our evaluation, suggesting that even more stations could be added before performance peaked.

While it's important to understand how a card will handle smaller frames, these sizes don't push the adaptor to its limits. For that, we conducted two additional tests. First, we tested with 4,096-byte frames, which are close to FDDI's legal limit. In this test, with traffic levels well into the 80Mbps range, all vendors' throughput began to level off at five clients and flatten out at six (see Figure 4).

In our final suite of EISA tests, we deployed Novell's Burst Mode. Here, a very different performance curve emerged: window sizes larger than one gave all the vendors a dramatic boost in aggregate server throughput (see Figure 5). Traffic levels began to flatten out with just two stations, and remained fairly steady for three through eight clients for all vendors. In fact, all vendors' results are remarkably similar in both the 4,096-byte and Burst Mode tests — perhaps a reflection of the importance vendors now place on achieving high-bandwidth numbers.

## Just Weight

In evaluating LAN adaptors, testing the ability to handle individual frame sizes in isolation is only part of the battle. Since LAN traffic involves a full range of frame sizes, we made sure to judge how well adaptors handle all kinds of frames and windows. And since FDDI typically is used as a backbone topology for clients on Ether-





# Solutions



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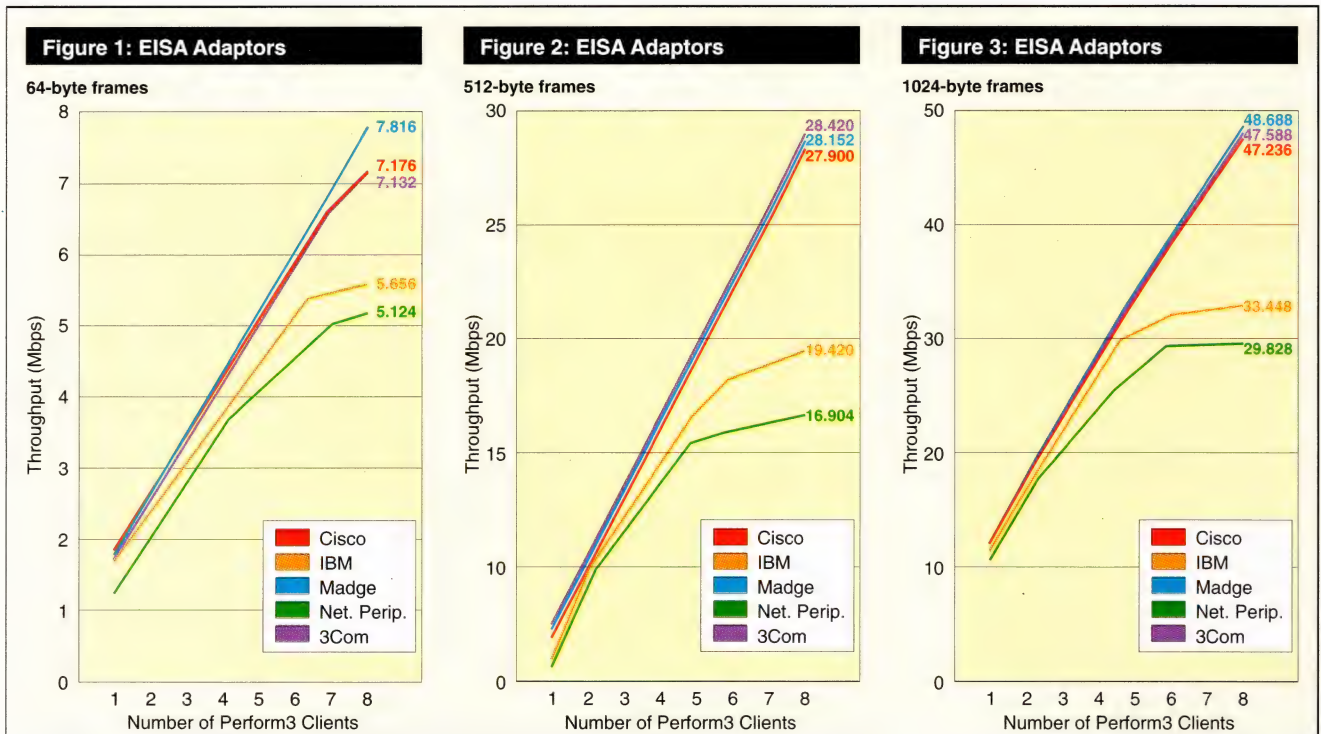
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net or Token Ring LANs, we also rated these products based on their suitability for FDDI-to-Ethernet and FDDI-to-Token Ring applications.

Our scoring places the greatest importance on maximum and minimum frame sizes, reflecting the traffic patterns on corporate backbone networks. In rating the cards for FDDI-to-Ethernet applications, for example, the 1,024-byte results accounted for 55% of the score, followed by 15% for 512-byte frames and 30% for 64-byte

frames. Tests with 4,096-byte frames or larger were not considered, since Ethernet doesn't allow frames that large.

For FDDI-to-Token Ring, (or FDDI-only) applications, we used these weightings: 35% for Burst Mode; 10% for 1,024-byte frames; 15% for 512-byte frames, and 30% for 64-byte frames.

In applying these weightings, we first assigned the top performer for each frame size a score of 10, and then divided all other vendors' scores as a percentage of this figure.

For instance, a card that showed throughput equal to 89% of the first-place finisher received a score of 8.9. Then we used the weightings to determine a composite score for all frame sizes. These composites were used, in turn, for scoring performance with one to eight clients, and our final ratings were based on these composite scores.

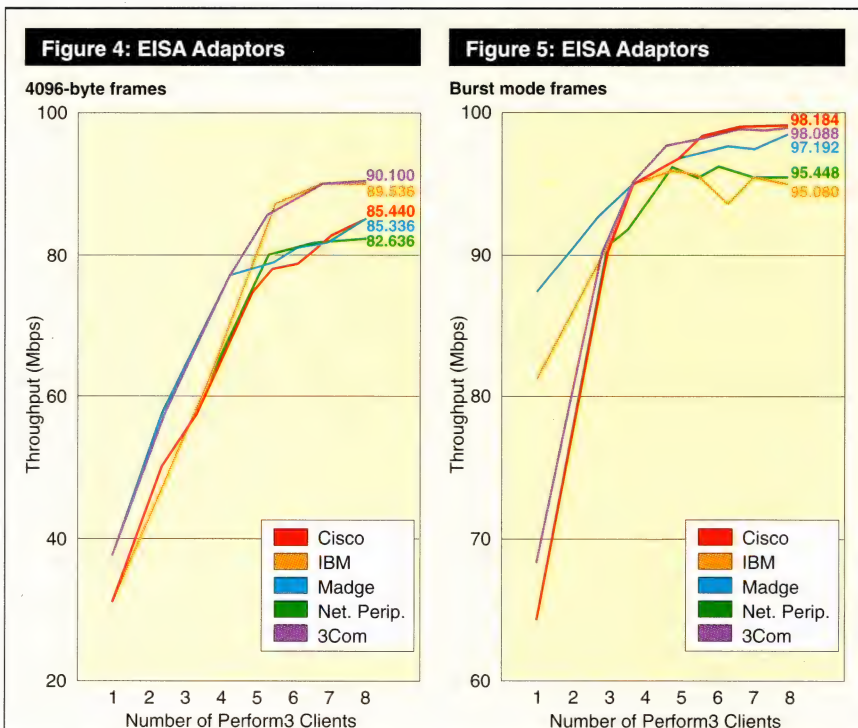
For our FDDI-to-Ethernet applications, Madge's adaptor emerged as the clear winner across the board — a little ironic, considering the company's Token Ring heritage. The vendor posted first-place finishes for one through eight clients, even widening its lead as stations were added (see Table 3 on page 101). Cisco and 3Com stayed close behind, with neither vendor posting a score below 9.6.

Madge also led the way in the Token Ring and FDDI-only tests, although its margin of victory was less pronounced (see Table 4 on page 101). Cisco and 3Com tied Madge in tests involving five to seven clients, with all three vendors posting nearly identical scores.

## The Sbus Tests

The Sbus architecture used in Sun workstations accounts for half the sales of some FDDI adaptor makers — not surprising given the high-bandwidth applications often found on Sun machines. While our tests didn't drive the Sbus cards to rates approaching 100Mbps, they do indicate how well Sbus cards handle various frame sizes and traffic levels from multiple stations.

Two vendors supplied Sbus cards for our test — Cisco and Network Peripherals. Our test bed consisted of four Sun workstations and TTCP, a public-domain traffic genera-





## Test Methodology

We invited eight makers of FDDI adaptors to submit EISA (Extended Industry Standard Architecture) and Sbus cards for this evaluation: Alfa; IBM; Interphase; Cisco Systems Workgroup Business Unit (formerly Crescendo Communications); Madge Networks; National Semiconductor; Network Peripherals; and 3Com. Alfa, Interphase, and National Semiconductor all declined to participate. All vendors that accepted our invitation supplied EISA cards, with Cisco and Network Peripherals also supplying Sbus adaptors.

The EISA test comprised two rounds. In the first round, we established a performance baseline by sending traffic between one server and one client, each equipped with the same vendor's adaptor card. The vendor with the highest-performing cards was then used in clients for the second round of tests, which would measure throughput when the server handles traffic from one to eight clients.

The EISA test bed consisted of a Powerframe 20 server supplied by Tricord Systems, equipped with 16MB of RAM. The server ran NetWare 4.01 from Novell, with directory services enabled. The client hardware comprised a Compaq Deskpro 486/66M, which served as the first client station, and seven Compaq Deskpro 486/33M machines. Each was equipped with 4MB of RAM, 120MB hard drives, and Microsoft DOS 6.2. All clients were con-

nected with the Commander from Cybes Corp., a device that allows multiple computers to be controlled from one keyboard and monitor. Clients attached to the server using NetWare's VLM program.

For the traffic-generating application in the EISA tests, we used Novell's Perform3 utility, not an ideal choice, but the best available. Perform3 reports only on data payloads; it doesn't measure headers and checksums, which can account for up to 50% of total network traffic at small frame sizes. With very large frame sizes, such as those used when Burst Mode is enabled, Perform3 numbers are consistently about 5% lower than those reported by a protocol analyser. But when Burst Mode isn't used, the relationship between Perform3 numbers and those for total traffic varies by frame size and by vendor.

Perform3 resided on the server and was invoked by one or more clients. We ran Perform3 twice at each of four frame sizes — 64, 512, 1,024, and 4,096 bytes — with each iteration lasting 60 seconds. We averaged the two iterations to achieve our results, which are presented in Mbps. We also enabled Novell's Burst Mode to evaluate the performance with large window sizes. For all tests, scoring was weighted to reflect each frame size's relative importance on networks.

Notably, the test design does not suggest FDDI is appropriate only for net-

works of eight clients or fewer. Perform3 generates input/output traffic at levels far higher than those of virtually any real-world application. Thus, each Perform3 client represents as many as five to 10 real-world clients.

In the Sbus tests, we used workstations from Sun Microsystems and TTCP, a public-domain traffic generation utility. TTCP generated both one-way UDP (user datagram protocol) and two-way TCP (transmission control protocol) traffic.

The UDP tests were conducted with one Sun Sparcstation 2 equipped with 32MB of RAM and SunOS Release 4.1.3. We used TTCP to send UDP frames at four sizes — 64, 512, 1,024, and 4,096 bytes. Tests were run three times, and results were averaged and presented in Mbps. The TCP tests were run using the same Sparcstation 2, configured the same as the first one; a Sparcstation IPC equipped with 48MB of RAM and running under SunOS 4.1.2; and a Sparcstation IPX equipped with 48MB of RAM and running under SunOS 4.1.2. The four frame sizes in the TCP tests were 128, 512, 1,024, and 4,096 bytes.

A Network Advisor from HP served as the measuring tool for all tests. We used an Expert Sniffer from Network General to verify frame sizes. All devices were connected with multimode fibre cabling and Interphase and 3Com concentrators.

**Kevin Tolly and David Newman**

tion utility. TTCP can send two kinds of traffic: UDP (user datagram protocol) and TCP (transmission control protocol) frames. UDP is a connectionless protocol; it sends frames as rapidly as it can without waiting for acknowledgments. TCP is a connection-oriented protocol, which means it requires a workstation to send an acknowledgment after receiving a predefined number of bytes. TCP/IP differs in this regard from IPX or SNA, both of which send acknowledgments in response to a given number of frames.

Obviously, UDP throughput will be much higher, since traffic flows in only one direction. For this reason, using UDP is a good way to stress-test an adaptor. TCP is also a useful metric because it closely resembles the two-way flow of most real-world applications.

As in our EISA evaluations, we used four frame sizes to test the Sbus cards. The UDP tests used the exact same frame sizes as the EISA tests — 64, 512, 1,024, and 4,096 bytes. However, because the TCP header alone is 65 bytes long, the smallest frame size we used for the TCP tests was 128 bytes.

For UDP traffic, the Cisco and Network Peripherals cards racked up nearly identical

performance (see Table 5 on page 102). Cisco had a slight edge at all frame sizes, although the two vendors' throughput differed by less than 2Mbps at three of our four frame sizes. The most significant difference was in the 1,024-byte frame tests, where Cisco outperformed Network Peripherals by nearly 4Mbps.

As in the EISA evaluation, our TCP tests sought to determine how much additional traffic an adaptor could actually handle before throughput levelled off. In this respect, using TTCP to send TCP frames is exactly like using Perform3 — one or more clients ask the machine under test to generate traffic, and the clients in turn send back acknowledgments.

Cisco's results in the TCP tests were remarkably even across the board: Throughput rose by only a small increment as second and third client workstations were added (see Table 6 on page 102). The slight upward curve held true for all frame sizes except for 512-byte frames, where adding a second workstation boosted throughput by 48%. Adding a third workstation raised throughput by only 6%, however.

However, Network Peripherals' results indicate no such rising curve. When going

from one client to two, throughput either actually declined or held steady at three of the four frame sizes. The most pronounced drop came with 1,024-byte frames, where throughput fell by around 54% when a second workstation was added. Unfortunately, hardware problems with one of the Sun workstations prevented us from testing Network Peripherals' adaptors with three clients.

We should note, also, that the Sbus test bed we used consisted of relatively low-end Sun machines — a pair of Sparcstation 2s, a Sparcstation IPX, and a Sparcstation IPC. Raw throughput certainly would be higher when using a more powerful workstation such as the Sparcstation 10s, but additional clients would likely affect performance by much the same proportions as we found in our tests.

*Kevin Tolly is director of the Data Comm Test Lab and President of the Tolly Group, based in New Jersey. David Newman is testing editor for Data Communications magazine, based in New York. Two research associates from the Tolly Group also participated in this evaluation — Steve Nawolski performed all test measurements, and Wayne Schiller served as project manager.*



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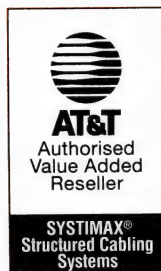
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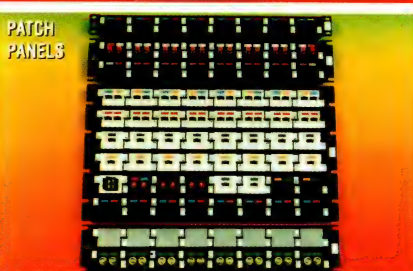
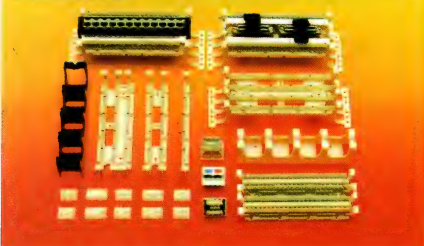
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## Multi Access Router

Cray Communications has released a new router designed to interconnect smaller sites and branch offices to the corporate headquarters. The new Multi Access Router supports a wide range of protocols including: IP via RIP or OSPF, IPX, OSI via ES-IS or IS-IS and DECnet IV and V, and in addition, Cray Multi-Path Bridging can bridge any remaining protocols.

The router features advanced MAC and network layer filters to reduce unwanted network traffic and implement security barriers, and also features Cray's own V.42 compression which compresses the entire data packet, not just the header, by a factor of up to 40 times.

The unit also reduces line costs via a link pool facility for dynamic backup, which means that over X.25, ISDN and PSTN links users pay only for the number of links established, not the number of remote locations called. Additionally, the router monitors data activity in each direction and establishes and clears connections as required.

Cray's Multi Access Router can be managed and monitored via the Cray Network Management Centre, or using Cray's DomainView management system. It supports BootP/TFTP and SNMP, and for remote sites a built-in monitor for management and configuration can be accessed from a Telnet or OSI session, or via a terminal which is directly attached to the router.

A single-board 'plug and play' configuration in a stand-alone dual-slot cabinet with pre-loaded software on FLASH-PROM, one casing and one slot free for expansion is priced from \$5,500 including tax. A Multi Access Router card integrated into a 2-slot Cray System Centre with 12 10Base-T ports, SNMP management, OSI and TCP/IP protocols sells for \$10,500.

**Cray Communications**  
(02) 451 6655

## Fast Fax/Modem

Australian modem vendor Banksia Technology has launched the new V.fast Class MyFastModem, which can handle fax and data communications at speeds of up to 28.8Kbps.

Featuring both error correction and data compression, the product is based on Rockwell's V.fast Class chipset and can support throughput to 115.2Kbps.

It also offers call blacklisting, callback security and a remote configuration mode, and will sell for \$799 including tax.

**Banksia Technology**  
(02) 418 6033

## Low-End ATM Switch

General Datacomm has announced a new low-end addition to its range of APEX ATM switches.

The APEX-MAC (Multimedia Access Concentrator) is designed to provide ATM capabilities in small workgroup environments, functioning as a switch-



*The Amazon can support up to five LAN and 18 WAN connections*

## Branch Office Bridge/Router

ADE Network Technology has announced the new Amazon bridge/router from Advanced Computer Communications (ACC). The Amazon features up to five LAN and 18 WAN connections, and can be tailored using field-installable interface modules including single, dual and hex WAN cards and Ethernet and Token Ring cards, to suit a wide range of network configurations.

ADE officials said the unit has an expandable, flexible architecture and can interface with the company's Nile bridge/router to provide users with a powerful solution for connecting branch offices to the corporate network. It also comes with the company's full suite of bandwidth optimisation features, which can reduce the size of data transmissions by an aggregate factor of 4:1. Bandwidth optimisation features also include dial-up routing; Dial-on-Demand, which places a call when data is queued for a specific destination; Dial Backup, which calls a backup link to re-establish a connection when the primary link fails; and Dial-on-Congestion, which adds a second link when the primary link becomes congested, shutting down the second link when the primary line clears.

The SNMP-compatible Amazon can forward 64-byte packets at an aggregate throughput of up to 14,880 packets per second, and supports a wide range of WAN protocols, including Point-to-Point Protocol (PPP), frame relay, ISDN, X.25, HDLC/LAPB and SMDS. Routing protocols supported include TCP/IP with OSPF, RIP and EGP, IPX with RIP/SAP, DECnet Phase IV, AppleTalk Phases I and II, and XNS. In addition, it offers support for Transparent Bridging (802.1d) and IBM Source Route Bridging.

**ADE Network Technology (02) 543 2677**



*Cray's Multi Access Router can compress data up to 40 times*

ing concentrator providing access to the ATM backbone.

It supports network applications such as LAN interconnect; circuit-switched data, voice and video using circuit emulation; frame relay and ATM switching; and transport of SMDS, X.25, HDLC and SNA/SDLC traffic.

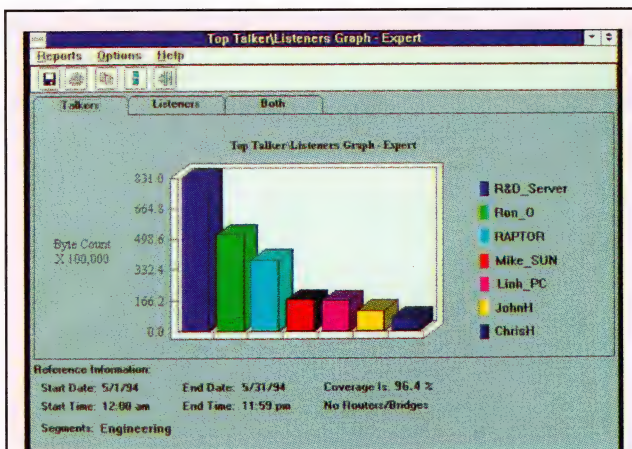
The product will also offer an NTSC/PAL video compression and adaptation capability in the near future.

The new APEX-MAC is scalable, and can accordingly be upgraded to provide the larger cap-

acity of the company's APEX-NPX or APEX-DV2 switches. It offers a robust traffic management architecture which allows ATM cells to be prioritised and switched according to the application. For example, the low delay requirements of voice and video traffic can be balanced with bursty LAN applications.

The new product's distributed buffering scheme and traffic policing protect against network overload and so improve transmission reliability and integrity, officials said.





The Network General Reporter provides more than 20 reports

## Management Reports Made Easy

Network General has released a new application which dramatically simplifies the task of producing management reports based on data collected by the company's market-leading Sniffer network analyser product range.

The new Network General Reporter provides more than 20 automated reports with over 80 options to deliver a multi-segment view of network performance, company officials said. The reports are generated from data stored in an SQL database and are based on Expert Analysis, standards-based RMON and customised network monitoring information. Users can specify the segment covered, style of graphical presentation, and data and time range monitored for each report.

Running under Microsoft Windows, the Reporter provides three report categories: Traffic Reporter, which presents network load information over a specified time period; Baseline Reporter, which presents comparative network or station information between two time intervals; and Investigative Reporter, which provides error, problem summary and trend information.

**Com Tech (02) 317 3088**

The switch has an open network management system, and is one of the few products to support Switched Virtual Circuits based on the ATM Forum UNI 3.0. It will be available from November, with a typical configuration starting in price at around \$45,000.

**General Datacomm  
(02) 956 5099**

## Async NetWare Access

DigiBoard has announced that its advanced cluster system, the EPC/X, is now available with a driver for Novell's Asynchronous Input/Output (AIO) spec. The driver allows up to 896 users to simultaneously access LAN services over modems at speeds as fast as 115.2Kbps.

The EPC/X System consists of a host adaptor card with a

20MHz RISC processor which is resident in the host computer, and EPC/CON-16 concentrator boxes, which can each support up to 16 modems or other asynchronous devices. The system can be expanded to support from 16 to 224 ports per expansion slot, and up to 896 ports per computer system.

It comes with a range of advanced features such as line diagnostics, pass-through fault tolerance, surge tolerance and optional fibre optic connections.

**SealCorp (02) 418 9099**

## Upgraded iSDX PABX

GPT has released a new version of its iSDX PABX which implements fundamental changes in its hardware and software.

GPT officials said four key components combine to move

the iSDX to an open PABX platform, known as the Open Communications Architecture.

These components comprise enhanced processing power; the widening of the PABX's control function via computer supported telephony applications (CS-TA); support for industry-standard application programming interfaces (APIs); and further implementation of telephony interfaces via support for Basic Rate ISDN and CT2 technology.

The new system uses a RISC processor, which increases the range and power of applications the iSDX can handle, particularly in accessing databases and using information from computer systems.

It also supports application programming interfaces from Novell and Microsoft, and Basic Rate ISDN is available across the entire range, allowing the provision of a full range of ISDN services such as videoconferencing, videotelephony, multimedia, Group 4 fax and conference calling.

**GPT (02) 350 9666**

## Intelligent Print Server

Techway has announced the release of the OpenConnect Systems Print Server (OCS), an intelligent Unix-based application which is able to route 3287 print jobs to both local or remote LAN-attached printers. When

combined with other connectivity solutions in the OpenConnect range, the product can print SNA files on any network or LAN-attached printer, obviating the need to have separate 3287-type printers for individual workgroups, officials said.

The OCS print server features logic code which limits the amount of disk space that can be allocated and the number of sessions which can be active at any time, giving network managers control over host resources to prevent overrunning memory and storage. It enables a single Unix processor to support and manage as many as 1,500 print sessions, and provides warnings if limits are approached.

The OCS Print Server can connect to SNA hosts running MVS, VM, VSE or OS/400, and supports multiple page descriptions and routing capabilities.

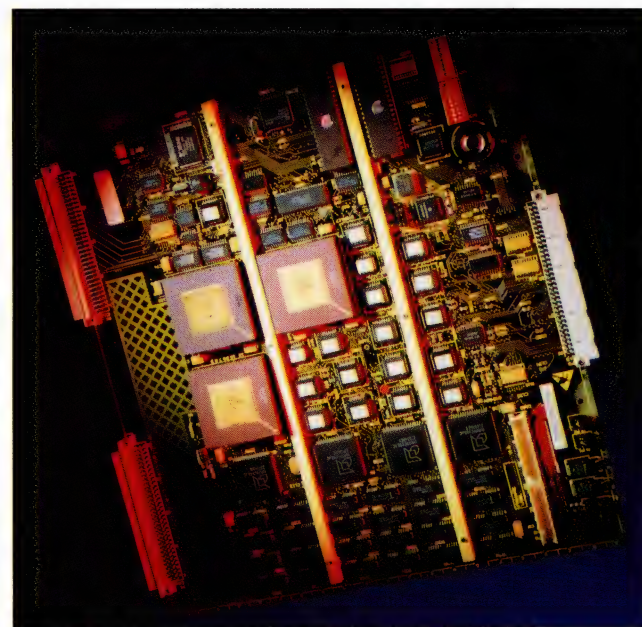
It is available for a wide range of systems including the IBM System/6000, the HP 9000 Series, Sparcstations, and Motorola's RISC-based workstations.

**Techway (02) 975 2122**

## Network Management

Complete Network Engineering has available two network management packages from Intrak, called ServerTrak for NetWare and TrendTrak.

ServerTrak provides users with a comprehensive range of



GPT's iSDX PABX system is based on RISC technology





SecurID is a security system for SynOptics hubs

graphical statistics about such factors as: cache activity, showing pending write and dirty cache ratios; disk activity, enabling users to ascertain a read-to-write ratio quickly; CPU activity; and LAN activity, enabling users to easily assess packet to Kbyte ratio. Company officials said a Windows version of the product is also due soon.

TrendTrak provides easy-to-read dynamic graphs which enable users to track growth and utilisation trends for major file server components such as memory usage, and disk, wire and CPU utilisation.

Over forty different statistics are available, including a large number of dynamic statistical ratios, and all are displayed via a simple menu interface with customisable menus and multiple print/view modes.

Time frames for analysis can be selected from a range of: Year, Week, Month, Quarter, 6-Months, Previous Week, Previous Month, Previous Quarter, Previous 6-Months and Previous Year. The analysis schedule can also be set a half-hour increments

by days of the week, enabling network managers to differentiate between work hour activity and off-hour activity.  
CNE (02) 439 1151

## Network Security

SynOptics Communications is offering a 'crackproof' network security system for its Lattis System 5000 and Lattis System 3000 intelligent hub families.

Supplied by Security Dynamics Inc. (SDI), the SecurID technology has been integrated into modules for the hubs, and will provide users with advanced security features and passcodes to eliminate unauthorised access to network data.

The SecurID card is credit card-sized, and uses a dynamic, two factor authentication to shield protected systems. The card displays a randomly generated access code which changes every 60 seconds, and to access a system users must key in their own PIN as well as this code.

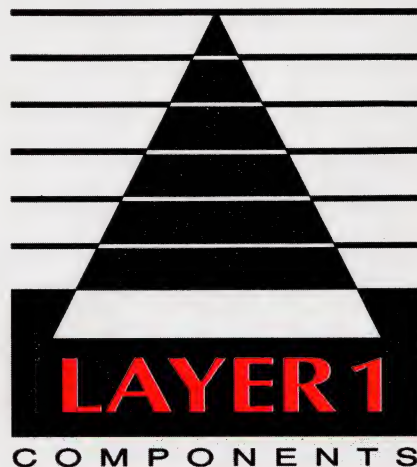
SDI's ACE/Server software, which is integrated into the SynOptics hubs manages passcode allocation from a central site.  
SynOptics (03) 853 0799

## Windows Network Management

Madge has launched TrueView Workstation Manager 2.0, a new Windows-based network management tool. The product, which consists of the TrueView Management Platform and Smart Agent management modules which

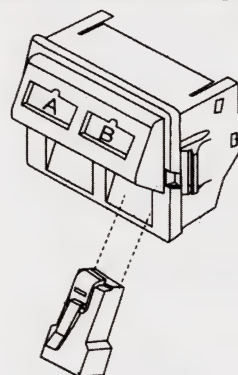


ServerTrak displays a wealth of useful statistics on system performance



## Standard Based Physical Layer Networking products

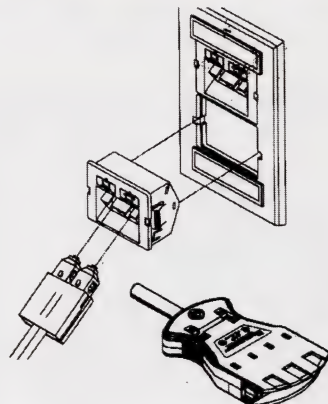
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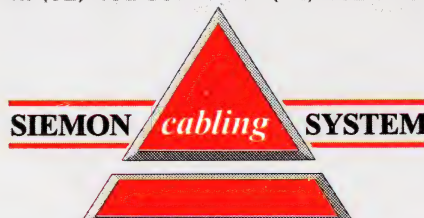


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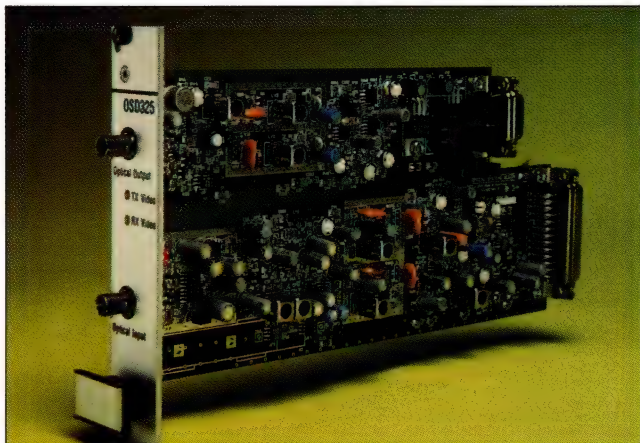
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Ph: (02) 482 3377. Fx: (02) 482 7766.







The OSD325 modem is built for applications like videoconferencing

reside in each workstation, is SNMP-compliant and features: central console control; remote file management with the ability to copy, examine and edit files on users' workstations from the management console; password protection for workstation agents; and integration with Novell NMS.

A free demonstration version is available on request.

**Madge Oceania**  
1-800 653 816

### Full Duplex Fibre Optic Modem

Optical Systems Design recently launched its new OSD325 fibre optic modem, which provides full duplex video, high quality program audio, data and 2-wire or 4-wire intercom with on hook/ off hook signalling.

Designed for applications which require audio, data and

video distribution, such as videoconferencing, CCTV systems and video/audio surveillance systems, the unit normally operates over two singlemode or multimode fibres, but can be fitted with an optional built-in wavelength division multiplexer for single fibre operation.

**Optical Systems Design**  
(02) 913 8540

### CD-ROM Super Towers

Imago Computer Solutions, an Australian vendor of storage systems, has announced an integrated and expandable CD-ROM-based on-line storage system which provides cost-effective access to between nine and 64 gigabytes of data, depending on the model.

The new CD Super Towers offer multiple users no-wait simultaneous access to multiple CDs and avoid many of the problems associated with other multiple access products like jukeboxes or CD stackers, such

as access difficulties or limited configuration options.

The new systems are available in seven models, ranging from 18 drives (9GB of storage) to 128 CD-ROM drives (64GB of storage), and multiple Super Towers can be easily linked together to expand capacity without performance degradation or other problems, company officials say.

The towers come ready for 'plug and play' operation, and can be accessed simultaneously from clients running DOS, Windows, Unix, Macintosh, Windows for Workgroups, Windows NT, and OS/2.

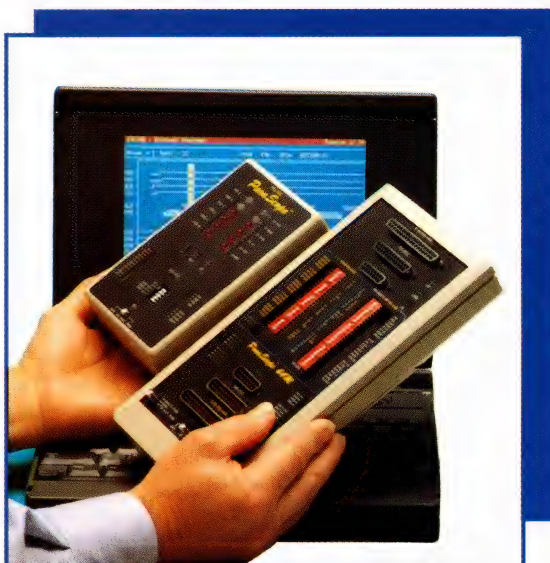
**Imago Computer Solutions**  
(03) 376 8020

### Fax/Data Modems

Alloy Computer Products has introduced WINport — software that turns data and fax modems into shared fax/modems which users can access as if they were attached directly to their PC.

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### ISDN

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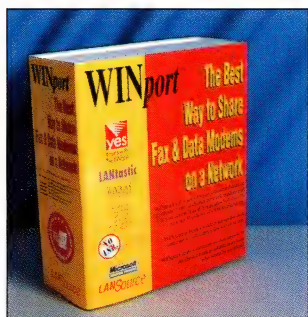
- **Speed** - 128Kbps\* and higher depending on PC platform (\*486)
- **Multiple Interfaces** - RS 232, V.35/V.36, X.21, RS 449 / RS 422 / RS 423 in a single hand-held unit
- **Fully Featured** - Including Programming Language, Simulation, BERT (G.821) and full Breakout capability.
- **Portable** - No internal PC hardware to install. Parascopes connects to the PC's parallel port and takes power from an a.c. adaptor or internal batteries.

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*WINport allows data and fax modems to be shared on a network*

The product is a single communications platform which operates as a modem server for data communications, as well as a fax server, and runs on any IPX or NetBIOS network, including NetWare, LANtastic, Windows for Workgroups, LAN Manager, DEC Pathworks and VINES.

**Alloy Computer Products**  
(03) 574 9891

## Signal Identifier

Testcom Data has released a new handheld 2.048Mbps signal identifier which allows field personnel to identify cables carrying 2Mbps data rates over twisted pair cable.

The Model 132 gives an audible and visual indication when it detects a digital cable — the audible signal is provided by the data on the cable transformed to an audible frequency by the unit's heterodyne receiver, and the visual signal is provided by an LED which varies in intensity as the cable is singled out of the loom.

The Model 132 also provides additional verification of the digital cable via a differential amplifier which eliminates induced or false signals, and has an attenuator for use in strong signal environments.

**Testcom Data (02) 630 7528**

## Voice/Fax/Data Mux

Multi-Tech Systems has released a new eight channel model of the MultiMux voice/data/fax high-speed multiplexer which can also support two voice/fax channels.

The MultiMux MMV808C/V can support up to eight asynchronous data channels, two voice/fax channels, and two composite

links. Each voice channel includes connector/interfaces for FXO, FXS and E&M operation, and the system operates over a single composite link at up to 256Kbps or over dual composite links at up to 128Kbps each.

Aimed at smaller offices, the system includes a built-in 2400-bps command modem to simplify remote network manage-

ment and maintenance. It features input channel speeds of up to 19.2Kbps, asynchronous data input, hardware and software flow control, EIA pass-through, downline parameter loading, channel pacing, operational statistics and system diagnostics.

Additionally, it is software configurable for items such as compression rate, interface type,

volume control, voice link selection and destination.

**Banksia Technology**  
(02) 418 6033

## New ISDN Range

Racal Australia has announced the launch of a new family of intelligent ISDN products. The

# Cost Effective Splicing Systems... ...we took up the challenge!



## Compact Fusion Set

Northern Telecom's Compact Fusion Set has been developed to meet the demand for cost effective splicing systems. There are an increasing number of applications for optical fiber splicers, from new construction to systems maintenance and restoration. The low capital cost of this splicer to voice/data contractors will reduce the cost of splicing in most applications

- Simple to Use
- Meets Industry Needs
- World Standards Tested
- V Groove Design
- Patented System
- Large LCD Viewing Screen



## Automated Fusion Set

Northern Telecom's Automated Fusion Set increases productivity resulting in substantial cost savings to high volume users. Operators will appreciate the set's ability to produce low loss splices under adverse field conditions without causing the fatigue associated with other splicers. It takes only a few seconds to align the fibers in auto mode and a complete splicing sequence requires only a few keystrokes.

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- Cost Savings
- Patented Splice Protection Package
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## PRODUCT FILE

range includes the DAP4000 Series Basic Rate ISDN Terminal Adaptors and the ISX5010 Access Multiplexer.

The DAP4100 provides on-demand access to Basic Rate ISDN and comes with a range of interfaces, including V.24, V.35, V.36 and X.21, configurable for speeds from 2.4Kbps to 64Kbps, as well as in synchronous or asynchronous modes. The adaptor also offers up to two DTE ports, allowing users to activate

simultaneous connection to two different locations.

The DAP4500 adds resilience to a digital leased circuit, continuously monitoring the connection, providing automatic backup over the BRI service in the event of leased line failure.

The Racal ISX5010 Access Multiplexer is built around a flexible, expandable architecture, allowing users to add voice and data channels, high-speed trunks, and full network manage-

ment. It can also connect a wide range of terminal equipment remotely over a single or multi digital trunk, which can be backed up by an integral ISDN terminal adaptor to maximise the link's efficiency and provide extra resilience.

**Racal Australia (02) 936 7000**

### HP Price Cuts

Hewlett-Packard has announced price cuts of up to 50% on its AdvanceStack network hubs, switches, bridges and routers. It is also bundling its AdvanceStack 10Base-T hubs with SNMP management cards, offering users a saving of around 20% compared with normal individual prices. HP says the reductions are possible because of improved manufacturing efficiencies and greater use of ASIC technology.

The AdvanceStack range includes five-year on-site warranties for hubs and three-year on-site for routers.

**Hewlett-Packard 13 13 47**



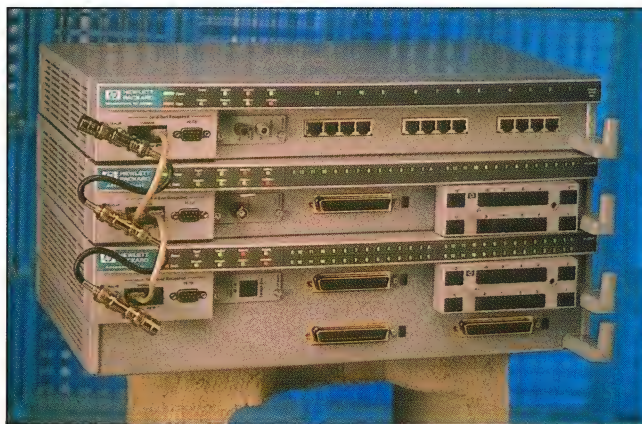
*The CorStream server is designed for LANtastic networks*

### CorStream Server

Artisoft has launched the CorStream server for use with its best selling LANtastic peer-to-peer network operating system.

A high-performance 32-bit dedicated server, the new CorStream is a LANtastic network NetWare Loadable Module combined with a runtime version of NetWare 4.0.

Built around a 32-bit multitasking, multi-threaded operating system, the server supports concurrent drive seeks and data spanning, and can also seek data across multiple drives.



*Prices across the HP AdvanceStack range have been slashed*

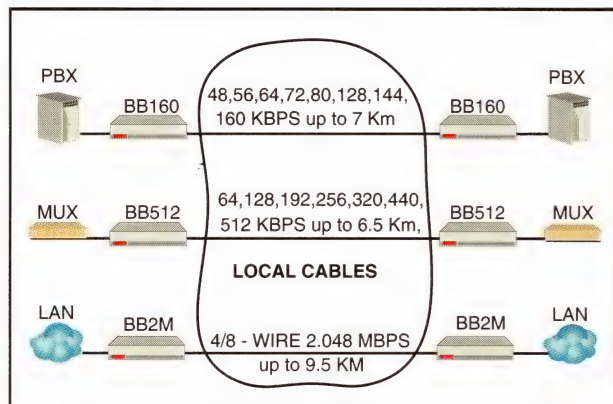
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The Axis AX-3 Cobra+ works with all major printer brands

Users can install as much memory as necessary to optimise throughput, and are not limited to file caching of 16MB. The system also offers fault tolerance, file system/media management and high reliability.

The CorStream can be purchased as a standalone server for existing LANtastic networks, or as a network kit including LANtastic 6.0 client software.

**Artisoft Australia**  
(02) 880 2688

## Axis Price Cuts

Intelligent Technologies has announced price cuts for the AX-3 Cobra+ external printer controller for IBM midrange systems.

The controller, which comes with drivers for all major makes of printer, features programmable printer drivers with editable character and FGID font translation to match printer font cards.

Additional features include transparent data pass-through, bard codes and BGU/APF graphics, and the unit comes with both parallel and serial printer connectors. The new price for the AX-3 Cobra+ is \$620.

**Intelligent Technologies**  
(02) 891 6010

## Visual Basic Tool

Eicon Technology has introduced a new communications programming tool called Access Tools, which works in conjunction with Microsoft Visual Basic and Eicon's Access for Windows 3270 and 5250 PC-to-host communications software.

The new software allows developers to quickly create front-ends to applications running on IBM SNA hosts. It contains a set of Visual Basic Custom Con-

trols that abstract complicated EHLAPI and Dynamic Data Exchange (DDE) programming into drag and drop operations without the need to alter any mainframe or midrange code or the writing of any EHLAPI code. The software can also integrate 3270 and 5250 data onto a GUI interface, and comes with extensive on-line help.

Users with no prior SNA or API knowledge can easily develop GUI front-ends for mainframe and midrange applications, and can re-engineer the emulations desktop much more quickly than they could using Visual Basic alone, officials say.

Access Tools must be used in conjunction with Eicon's Access for Windows 3.21 and Vis-

ual Basic 2.0 or better. It is priced at \$1,990.

**Eicon Technology**  
(02) 959 1960

## TR PCI Adaptor

Olicom has unveiled what it says is the world's first Token Ring Peripheral Component In-



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Nextest's 4500 Series Fiber Optic Power Meters greatly simplify turning up, testing, and maintaining single-mode fiber optic links. The 4500 Series Power Meters eliminate the need for technicians to carry separate power meters, light sources, ORL testers, and fiber optic "talk" sets. Testing is greatly simplified, while overall costs are reduced.

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terface (PCI) adaptor which can deliver 'plug and play' performance for both server and workstation applications.

The adaptor has a full 32-bit PCI bus master interface, and features high frame rates and

low latency, achieving peak data transfer rates of up to 133Mbps. It operates at both 4Mbps and 16Mbps, can autosense UTP and STP connections, and is supplied with an optional Flash Program Load.



Cisco's 7000 and 4000 series routers now have ISDN capabilities

It also features Olicom's PowerMACH drivers, and a comprehensive set of desktop management capabilities based on SNMP and Desktop Management Interface (DMI) standards. Management information can be easily retrieved using the Olicom Adapter Info for Windows utility, which translates DMI data from the PowerMACH drivers into easily read configuration/performance information.

The 'plug and play' PCI spec of the adaptor provides automatic configuration for memory, I/O space, DMA channel and interrupt level, and the adaptor also features a software-driven utility for simple installation.

**Force Technology**  
(02) 971 1000

## Cisco ISDN Routers

Cisco Systems has expanded the ISDN capabilities of a number of its routers. From this month, the company's 7000 Series core router product line will come

with an ISDN Primary Rate Interface (PRI), the 4000/4500 regional router line will gain a new ISDN Basic Rate Interface (BRI), and a new model of the Cisco 2500 will be available for entry-level ISDN applications.

ISDN PRI for the 7000 Series will be implemented using a software option for the Multi-Channel Interface Processor (MIP), a high-density WAN access card. Each card supports one or two PRIs, connecting up to 240 ISDN channels from a seven-slot Cisco 7000 unit, and allowing users to easily switch between channelised leased line services and ISDN.

Cisco's mid-range 4000 or 4500 products will receive BRI support via a network processor, priced at \$11,390 for four ports or \$18,984 for eight ports.

The ISDN versions of the Cisco 2500 will cost \$5,221 for one Ethernet and one ISDN BRI port, and \$6,407 for one Token Ring and one ISDN BRI port.

**Cisco Systems**  
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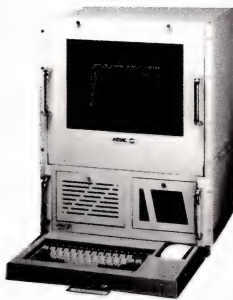


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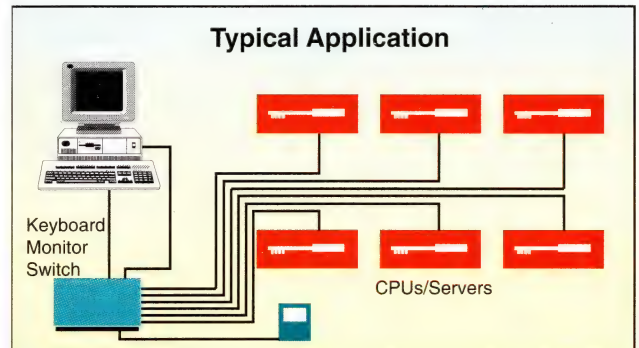
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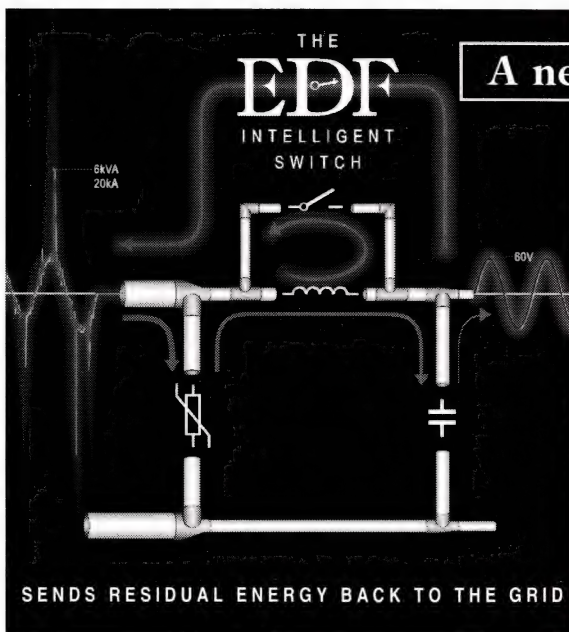
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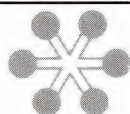
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Editorial by Wally Rothwell



## No Scrambled Eggs, Please!

It all started with a Helen Meredith article entitled 'Telstra Dilemma: Float Now or Pay Later.' Although the debate about privatisation of all or part of Telstra had been going on for quite a while before Helen focused on the various issues in her article, it prompted me to write to the *Australian Financial Review* to add a few points from ATUG's position.

The article posed the question of whether the time was right to sell off Telstra, with analysts saying that its value was at a peak, or whether such a sale was wise at this time — 'do you sell the cow then it's milking so well?'

ATUG has always been fairly ambivalent about the privatisation of Telstra, and we really do not think it makes much sense to sell it off at this time, when it is struggling to adopt a new, competitive, customer-focused culture and when it faces the full blast of open competition only three years from now.

It seems that privatisation would be enormously disruptive to the relatively smooth dynamics of our current evolution towards full competition.

The only motives for a sell-off now would appear to be to take advantage of its peak value, or for the current government to privatise under its own terms, before the next election, in case it were to lose — both good reasons if you are looking at it from a government/owner's point of view.

ATUG's ambivalence does not extend though, to the selling off of Telstra as an entity. We would suggest that, while eventual privatisation is probably inevitable, private investment should only be contemplated in specific business arms of Telstra, not in tranches of the whole.

If we are to see a continuation of the active competition we are now beginning to enjoy, there needs to be a quite clear indication that accounting separation within Telstra is actually working. So far, this seems not to be the case, except with MobileNet.

This was a pro-competitive requirement of the government, to ensure that the non-competitive arms of Telstra did not subsidise the business elements which compete in the open market, thereby thwarting fair competition.

Austel seems to have grasped this nettle in the forming of its Decision Making Framework (DMF) and is demanding clear cost-justification for new tariffs. That is to be applauded.

### Structural Separation Queried

Soon after my letter was published in the AFR, I received a strong letter from one

of our supplier members, criticising what was seen as a policy of 'dismemberment of Telstra into discrete and specific arms suitable for piecemeal privatisation.'

It was seen to have the effect of Telstra losing its universal telecommunications competence and of denying the carrier that critical mass necessary for the economies of scope and scale to be realised in providing vital service offerings and in effective operation in overseas ventures. In any argument there are, of course, two sides, and this one was cogently put. Hopefully, though, we are not too far apart.

ATUG does not see that structural separation would 'dismember' Telstra, nor do we feel that, say, 49% investment in any of those structures would necessarily weaken Telstra's control over its various arms. But it could provide the much needed funding of which Telstra is starved nearly every year, when it comes to the balancing of government versus internally generated funds injected into its operations.

ATUG's primary concern is to see that the benefits of competition are passed on the users. We cannot have vibrant competition if the underlying costs, related to tariffs, are unclear. Therefore, if accounting separation is not working, ATUG will push for structural separation — without dismemberment!

But if Telstra is sold off as an entity, even in tranches, the egg will be scrambled and users may never understand the costs on which their tariffs are based.

**Wally Rothwell**  
Executive Director



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# Callback Telephony To Grow

Services involving Callback are set to grow — arguably substantially — along international telephone circuits, following important legislative rulings in the US. Involved are mostly lesser known American carriers, which win business by often indirect means, and by paying cheaper rates to better known carriers, such as AT&T and Sprint.

The trick for suppliers is to sell back to telephone users rates less costly than the frontline carriers usually quote. It works when users call an intermediary overseas telephone number prior to calling the number they really want. Their first calls ring one, two or three times and the line goes dead. Then they are called back and connected to their ultimate call. Computers log in sources of the original call and automatically call back users.

Often non-bona fide carriers are involved, and users can get particularly cheap rates — in the below \$US1 per minute region — they could not normally achieve. They also get bills from a new party. Rates down to as low as \$US0.40 a minute have been reported!

The practice has been going on in Australia for some time, mostly involving US carriers, with consumers making their original 'connections' via operations such

as Mastercall's International Telephone Service from Sydney-based Teleconnect Australia, which advertises as 'providers of telecommunications services.' There also services offered by Brian Spence's Optimum Memory Products (Mastercall also).

## FCC Approval

Of greatest interest this year, sources confirm the US Federal Communications Commission (FCC) has quietly backed computer telephony service providers in a ruling approving the activities of applications from Callback operators VIA USA, Telegroup and Discount Call International. It means, ATUG understands, that new developers don't have to worry about getting stuck with a system they can't sell. These companies wanted to resell international public switched services through Callback. ATUG, which is conducting its own research into Callback, understands the FCC's action should prompt other resellers and would-be resellers who have been screaming loudly on the sidelines to also get started in Callback. It could well be, at least temporarily, good news for astute consumers who want to save some money, but bad news indeed for the likes of Telstra, Optus and AAPT in Australia, and AT&T, MCI, Sprint, BT and IDB Worldcom/LDDS and others overseas, who are distributing many of the calls when they land abroad.

back with a US dial tone and you call anywhere in the world." Mastercall is believed to be aggressively seeking distributors/agents. "Becoming a distributor or agent for Mastercall entitles you to a commission (minimum of 7%) of your client's Mastercall telephone bills per month for as long as they use the service. Also, if you recruit and train others, you will be rewarded with a percentage of their total sales."

The Mastercall service is promoted as a 'business opportunity' via multiple-column advertisements in newspapers.

Interestingly, none of the international carriers out of Australia — and ATUG has talked with all — know how much business they are losing to Callback. They are presuming it's small to date, but they are unable to unravel at this stage which of the largely unknown carriers are piggybacking operations along their circuits. There is little profit margin here for the major carriers — AT&T is believed to be particularly peeved.

Tom Barker at IDB Worldcom in Sydney — an old OTC hand and an astute observer of the telephony market — says the carriers are 'probably more concerned than they admit' and adds that the practice 'won't go away now.' Another source, Tom Crowe, a partner with the Washington DC law firm of Campbell & Crowe, urges those interested to study the little-publicised FCC ruling.

As long as international accounting rates remain in imbalance, US international Callback service entrepreneurs will exploit the opportunity. And of course call rates must

## ATUG Legal Line Service

**Members needing legal advice in the communications area should take advantage of ATUG's Legal Line Service. The service is run by ATUG director and chairman of ATUG's Legal Sub-committee, Gerald Wakefield.**

**Members with legal queries regarding international telecommunications law and regulatory policy; radiocommunications; broadcasting and satellite law and policy; computer technology law; and intellectual property law are invited to consult ATUG on (02) 957 1333.**

## Where's the Action?

So where are the Callback operators doing best? They profit most where there are major price discrepancies between prices of overseas phone calls in differing countries, but for outward calls from Australia, rates have dropped, so they must come up with very keen prices indeed. ATUG understands that while calls to the US has been and remains the major route exploited to date, greater margins will be achieved by Callback marketers flogging connections into higher rate countries such as Latin America, Japan and South Africa. Teleconnect, for one, emphasises South Africa and Japan, while Mastercall/Optimum claim up to 51% savings to Spain and Israel.

"Every subscriber receives their own phone number in New York," says Mastercall. "You call this number, let it ring once and hang up. This alerts the service that you require an international line. You are called



### SYDNEY

**Level 11, 80 Alfred Street  
Milsons Point, NSW, 2061  
Australia**

**Tel: (02) 957 1333, (008) 22 6281**

**Fax: (02) 925 0880**

### MELBOURNE

**Level 1, 84 Johnston St  
Fitzroy VIC 3065  
Australia**

**Tel: (03) 416 1848**

**Fax: (03) 417 3002**



be cheaper than rates out of Australia for the middlemen to make a buck. But, theoretically at least, major balances of telephony revenues between countries such as Australia and the US could be transposed.

The overall market? If you really want to know and can't wait, you could invest \$US1,995 and buy an in-depth study called 'The Market for International Callback Services,' from the Rita Tannenbaum team at Probe Research of New Jersey.

### Opposition

AT&T remains the biggest opponent of Callback, but it hasn't been all 'lose, lose' for the American giant. Within the FCC ruling, calls must be completed at tariffed rates rather than calls used merely as signals at the Callback provider's switch, according to US magazine, *Computer Telephony*. It is no secret AT&T vigorously opposes 'code calling,' and arguably it is not being properly compensated for use of its facilities. But the FCC found that 'code calling' didn't happen often enough nor make sufficient use of the network to impose costs on AT&T or its ratepayers. The FCC confirmed that callback providers are regulated common carriers subject to its jurisdiction. They must get hold of 'Section 214 authorisation' or licence to resell international switched voice services from the FCC before providing such service.

The ATUG jury is meantime 'out' on whether Callback is a good thing for Australian users. Keep reading these pages!

### 11,000 Calls for TIO

The world's first telecommunications industry ombudsman scheme has received 11,663 enquiries and complaints during its first eight months of operation. "Given that we are an office of last resort, to have received more than 1,450 calls a month demonstrates widespread consumer concern," said Telecommunications Industry Ombudsman, Warwick Smith.

These calls generated over 5,000 cases, of which about 40% related to billing problems, including credit control; a further 12% were complaints about service problems; 8.6% concerned privacy issues; 5% covered problems with mobile phones; while directory and service delay gripes constituted 5% of total cases.

## Canberra to Ride Superhighway

The Australian Government is anxious to be involved with at least the content of information on the much-touted 'information superhighway.' This is spelt out firmly in the interim report from the Broadband Services Expert Group (BSEG) entitled *Networking Australia's Future*.

It raises a bevy of issues but also shows that Canberra intends to be much involved itself. The BSEG, headed by the Chairman of the Australian Broadcasting Authority (ABA), Brian Johns, is examining the technical, economic and commercial preconditions for the widespread delivery of broadband services — 'the information superhighway' — to homes, schools and businesses in Australia. Your submission or reaction to the interim report is due by the end of calendar 1994. Some \$10 billion is forecast to be invested, over 10 years.

More than 100 organisations, including ATUG, delivered submissions to the interim report. Notably absent (unsurprisingly) were details of cable laying plans for Pay TV by Telecom and Optus. Johns stated that the most 'exciting aspect' was the opportunity to create 'content' — the information carried by broadband networks. In doing so, Johns also foreshadowed Canberra concerns about control of this information, especially by large media groups, but he effectively absented Canberra from a direct involvement in the multi billion dollar high-tech infrastructure to carry the same.

Johns allows that the content 'stands to change our private lives, our education, how

we do business and the delivery of government services.' It will also generate 'considerable wealth.'

The interim report was launched by the Minister for Communications and the Arts, Michael Lee. Within the 96-page analysis, the BSEG identifies six 'headland' issues. They, it believes, hold the key to successful participation by the community in the new Information Age. They are:

- Broadband services can transform the way we live, work and play, but the process requires careful planning and management;
- Development of broadband services and networks needs to be encouraged if Australia to remain internationally competitive;
- Ensuring access for all Australians will be a key challenge for the implementation of broadband networks;
- Providing content for the new broadband services represents a major opportunity for Australia;
- The Government should exercise leadership in broadband services, especially as a leading-edge user;

A number of very different delivery technologies are likely to compete for the broadband market: "*We do not think it is appropriate for us to try to identify the best delivery technology for the new services.*"

Interested organisations are now given notice of the ultimate path the BSEG is travelling — and it is looking ahead 10 years.

### Optus Gets More Space in Space!

The new Australian satellite B3 is being brought into service, rather than being 'parked,' giving Optus the extra DBS capacity it has been pitching for. B3 went into trajectory in August this year, goes into station in mid-1995 and into service third quarter 1995.

B3 was delayed by over a week by launch computer problems. Optus says it is reconfiguring the system to make another A-Series transponder and half of a B-Series transponder available to its customers.

ATUG has been and is involved in closely monitoring the situation (via its

CEO Wally Rothwell), and these efforts have included talks with Optus top management. Ian Boatman, Optus's Chief Operating Officer, says Optus will soon have two A-Series transponders and half a B-Series transponder.

The changes will meet a significant demand for new services which could not have been met by satellites A3 and B1. "B1 was always expected to replace A1 (achieved) and the second B-Series replaces the second A-Series, leaving the youngest A-Series to a short residual life in geostationary orbit or an extended life in an inclined orbit," he adds.



### Code of Practice for 'Mobile Churn'

The first Code of Practice for the burgeoning mobile phone sector — aimed largely at phoneset dealers and churn specialists — is expected to be operable by the end of calendar year 1994. This follows meetings on the 'churn problem' organised by Austel and attended by ATUG and others. The limited negative ramifications of churn reflect the fast growth of mobiles — 70% per annum — as the number of phones in Australia grow from the current one million-plus mark to a forecast four million by 1998.

The first Code of Practice committee meeting to consider a draft Code of Practice for the mobile phone supplier sector was to take place on August 29 in Melbourne. This meeting at Austel's offices in Melbourne on August 5 was called to assess the desirability of establishing such a code to address some mobile 'churn' and 'slamming' problems. ATUG joined a working committee to help initial drafting of the Code. The draft committee comprised Telecom Australia, Optus, Vodafone, and an industry association, the Cellular Dealers' Association of Australia (CDAA).

Austel's John MacMahon, General Manager, Industry Affairs, called the August 5 meeting in the light of industry concerns after private and business complaints concerning churn around Australia. Churning occurs as either mobile dealers and/or specialised churn companies/individuals endeavour to persuade mobile phone users to switch carriers (either Telecom, Optus or Vodafone). It was seen as advantageous to have agreed procedures governing churning: the procedures should also be capable

of addressing the question of excessive pressure which may be applied in the churn process.

Slamming occurs when third parties switch carriers for mobile or other services for telecoms users, without proper authorisation from users.

#### Objectives

Attendees of the August 5 meeting — who also included SPAN, the AMTA and CTN — agreed that a smaller group should go ahead with drafting a Code of Practice. They discussed objectives, operational and marketing issues, plus the administration of the proposed new code. Objectives included transferring customers quickly and without interruption to their newly designated services and to promote industry relationships which are 'fair and reasonable.'

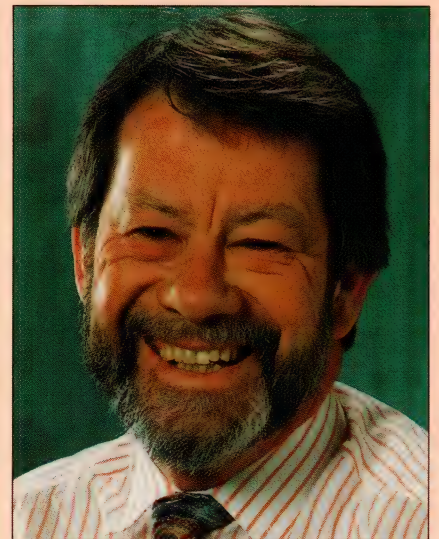
Operational issues included coverage, completion of applications (to change carriers), transfer of applications, prompt transfer of service, protection of privacy, failure to provide copy of applications and consequences. Marketing issues covered accuracy of information, balance in sales approach and contact with customer after transfer (by losing carrier). Administration of code covered possible mechanisms to have all levels of industry apply, industry committees, and dispute resolution procedures. The latter was initially to involve designated industry committees to oversee its operation, or in direct negotiation, referral to another party, referral to an independent arbitrator and penalties.

### Managing Policy at ATUG

A new appointment has been made at ATUG's head office in Sydney. Ken McGregor has joined as Manager, Policy, to oversee research, some submissions and public relations. Issues manager, Alan Robertson, has retired but is consulting to ATUG regarding conference speakers/topics for ATUG '95, which will be held in Sydney in May.

McGregor has a background in journalism and research, including 12 years at John Fairfax as technology and special reports editor on *The Australian Financial Review* (AFR), the Managing Editor of *Today's Computers*, and founder of the electronic Infoline. Infoline established the first electronic stories callup of any publication (the AFR) in Australia and signed Australian representative rights for the National Technical Information Service (NTIS), based in Springfield, Virginia.

McGregor completed a live-in course with NTIS in Washington DC. He also spent four years as roving assistant editor for Pacific Islands Monthly (PIM), served as a 'workaway' on cargo ships across the Pacific and completed a stint with *The Los Angeles Times*. Then followed a time in Perth as Media Manager, Acquisitions, for the Bell Group, reporting to the late Robert Holmes a' Court. Most recently he edited magazines out of Sydney, covering the food and packaging industries. "At ATUG it's exciting to be part of a growing independent group in a dynamic industry," he says.



Ken McGregor

### Telecommunications Act on Disk

The new EIS Electronic Law Book now includes all the updates to the Telecommunications legislation along with Broadcasting and Radiocommunications legislation.

The publication, on a floppy disk, is available to ATUG members at the special price of \$150 including postage and packaging — a saving of \$50. A subscription including a further two updates is also available for the special price of \$295 — a saving of \$100.

To ensure that you have the legislation at your fingertips at all times, take advantage of this special offer.

Contact ATUG on (02) 957 1333 for details of how to order.



### Personal Faxes — Will They Fly at \$800?

Will Australians buy personal faxes in big numbers for strictly personal or small business use if priced under \$1,000? Telecom is quietly betting \$800 might do the trick, while some suppliers claim the magic price is even lower — \$500 or even \$300. But it's probably much easier justifying a fax for even the smallest of companies than using the beasts to organise a dinner party.

Telecom Technologies (TT), Telecom Australia's wholesale systems arm, says the personal/home fax will take off in Australia at the \$800 level, and has embarked in recent weeks on a major promotion of its Smartfax, prior to launch later this year of another new product line — Partner cordless telephone systems.

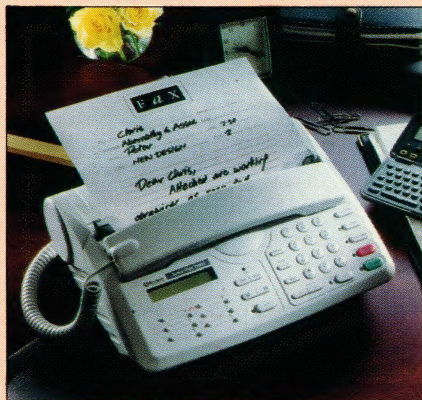
TT says that of an estimated 600,000 fax units installed in Australia, 6% of units are

already resident in private households. It estimates it could place 40,000-50,000 Smartfaxes in additional homes in the next two years, effectively doubling the personal market by 1997.

The big switching/broadcast players for fax, such as AT&T Easylink, are hoping Telecom is right, as are AAPT and Pacific Star. TT's Simone Semmens is also including small business in the Telecom foray. Involved are fully-imported French-made Sagem units, with built-in fax/phone switches which automatically recognise and direct calls to the fax or phone. Sagem, says Telecom Technologies' PR coordinator, Caroline Newell, is "barely building enough units to fulfill demand in Europe."

Smartfax units — there's a \$849 model and a \$1,099 model — are being sold via retailers such as Myer, Retrovision and Bing Lee, plus specialised communications stores. Industry sources confirm that limited supplier interest exists currently in the home fax market above \$500 because of poor profit margins. The below \$500 market is yet to be established.

Canon remains market leader for higher priced business faxes, with Sharp and Panasonic running number two and niche players such as Konica, growing fast. "A consumer market for faxes is still awaited," says a Konica dealer specialist. "The margins aren't there for most business fax makers or dealers — they would have to be sold in big volume via retailers and probably start to replace regular mail to an extent."



Telecom's Smartfax 3000

### In Action at ATUG

The fourth annual seminar and exhibition, organised by ATUG Queensland, was a real winner, with some 40 exhibitors and over 200 delegates involved.

It was held Thursday, September 1 at the Hilton Hotel, Brisbane, with the keynote address being delivered by Neil Tuckwell, acting chairman of Austel. Sessions included: fibre optics, cable systems, open systems, mobiles, wireless data, ATM, broadband services, voice/data, digital video and 'telecoms and Queensland.'

Exhibitors at the Hilton included: AT&T, Krone, Plessey, Datacraft, PictureTel, Exicom, Optus, Ericsson, Racal, Fujitsu, Alcatel, Telstra.

#### Breakfast

With two successful meetings concluded, ATUG's third 'Telecommunications Breakfast' is set for Newcastle this month, with Warwick Smith, the Telecommunications Industry Ombudsman, as speaker. Over 30 attendees are expected.

ATUG's first working breakfast attracted nearly 50 people and was held in Perth in July, with Neil Tuckwell, acting chairman of Austel, speaking. In August, at the Canberra Hyatt, some 30 attendees enjoyed an address by Dr Stephen Elliott, Director, Information Research, at UNSW, Sydney.

These breakfast briefings are free, by ATUG invitation only. Watch these pages for details of coming functions in Brisbane and Sydney.

#### ATUG Membership Increases

ATUG membership continues to grow, reports Owen Richards, National Business Manager at ATUG's Melbourne office.

Recent new names on the membership list include: Prudential Assurance, Hambros Equities, Kwasar Networks, Corinthian Engineering, Stronglink, Techniche, Base Computer Systems and RE&M Allen. Other companies that have signed up recently include Australis Media, ICM Australia, Royal Automobile Association of SA, Meridian VAT Reclaim Australia, AHTechnology, Oscom International, Retix, Macquarie University, AQIS, Pinnacle Communications, Precision Micro Systems and Aries Australia.

### Interception & Recording?

**Want to find out more about call interception and recording? Or any other topic in the Telecommunications Broadcasting or Radio-communications legislation? Then you need the EIS Electronic Law Book on disk. The new EIS Electronic Law Book has been released and now includes all the updates to the telecommunications legislation along with Broad-casting and Radio- communications legislation.**

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**To ensure that you have the legislation at your fingertips at all times contact the ATUG secretariat for details of how to order. Telephone (02) 957 1333.**



## October

**19-21 Asia Pacific Fibre Optic Telecom '94**, Conrad Hotel, Hong Kong. With the Asia Pacific market for fibre optic technology expected to grow to \$US4 billion by 1999, this event aims to provide valuable information on the directions and opportunities in this fast-growing region. A range of topics including new services and applications will also be covered. Enquiries — IBC Technical Services +65 732 1970 Fax: +65 733 5087.

**24-25 ATA '94**, Hotel Nikko Sydney, Potts Point. The Second Annual Conference of the Australasian Teleconferencing Association will comprise a comprehensive briefing on practical strategies, standards development, applications and future directions for the teleconferencing industry. As well as recent technological changes, the event will also feature an expert panel of international and local speakers, and nine international videoconference presentations. Fee: \$1,395. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

**25-27 Australian International Virtual Reality Conference**, World Congress Centre, Melbourne. Australia's first virtual reality conference will be hosted by software supplier Integra, and will feature key speakers and workshops to discuss issues in-depth and offer hands-on sessions. An exhibition will run concurrently with the conference, and will feature both commercial and entertainment-based VR applications. Enquiries — AUSI-VR '94 Conference and Exhibition Tel: (08) 234 1145 Fax: (08) 234 1148.

**25-28 Communications India**, Pragati Maidan, New Delhi. This trade show will display a full range of telecommunications hardware and software in the areas of voice, data, visual display and radio. An associated technical conference will cover cellular mobile, networking and rural telephony. Enquiries — Exhibitions India Tel: +91 11 462 2710 Fax: +91 11 463 3506.

**25-27 Microwaves '94**, Wembley Conference & Exhibition Centre, London. This conference brings together Europe's largest gathering of microwave experts engaged in R&D for telecommunications and civil and military systems. The program covers the entire microwave and millimetre wave spectrum, with supporting RF and software technologies. Enquiries — Nexus Business Communications Tel: +44 322 660 070 Fax: +44 322 667 633.

**26-27 Pay TV in Australia**, The Ritz Carlton, Double Bay, Sydney. This two-day conference will examine the current status and likely future developments in the Australian Pay TV industry. Among the issues examined will be local content, Pay TV regulation, consumer issues and the financial aspects of the new industry. Speakers include: Senator Richard Alston, Shadow Minister for Communications; Neil Gamble, CEO Australis Media; and Wayne Nowland, Director, Business Development, Optus. Fee: \$1,395. Enquiries — IBC Conferences Tel: (02) 319 3755 Fax: (02) 699 3901.

**26-28 Paging Asia '94**, Marina Mandarin Hotel, Singapore. This conference examines the potential for paging within the Asia Pacific region, which, with its relatively underdeveloped telephone infrastructure, represents a potentially explosive growth area for this kind of technology. Issues covered will include government policies, market deregulation, the role of private operators, and demand projections for the future. Fee: \$US1,920. Enquiries — IBC Technical Services Tel: +65 732 1970 Fax: +65 733 5087.

**26-28 Understanding the Telecommunication Revolution**, Savoy Park Plaza Hotel, Melbourne. This seminar provides a practical, plain-English explanation of the telecommunications industry, current and new technologies and applications, standards, network architectures and regulatory issues. For convenience, the course is divided into three separately-bookable days covering voice communications, data communications and emerging technologies, and the event will also be held in Sydney in early November. Fee: all three days \$1,795; any two days \$1,295; any single day \$795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

## November

**2-5 INTELCOM '94**, Turin, Italy. The INTELCOM '94 Conference and Exhibition will this year address a wide range of business and technology issues in the communications field. Main topics include broadband transmission technologies, multimedia and use of the local loop to deliver advanced image services like video-on-demand, and backbone and wide area networking issues. There will also be streams on intelligent network applications, tariffing, regulatory issues and new telecommunications services. Enquiries — Adtech Publications & Exhibitions Tel: +44 71 235 8431 Fax: +44 71 235 7841.

**5-10 MANTECH '94**, Pragati Maidan, New Delhi, India. This seminar and exhibition on the latest manufacturing technologies is organised by the Federation of Indian Chambers of Commerce and Industry. It provides all participating countries with the opportunity to present state-of-the-art technologies in manufacturing, communications and electronics to Indian business, and coincides with the conference of the International Chamber of Commerce, which will attract delegates from 130 member countries. Enquiries — Adesh Goel, PN International Tel: (02) 328 1948 Fax: (02) 327 1975.

**14-16 Pan-Asian PCS '94**, The Hong Kong Convention & Exhibition Centre, Hong Kong. This regional summit focuses on personal communications services, and will feature top-level speakers addressing such issues as service descriptions, market projections, technology choices and regulatory matters. A separately bookable fourth day will cover personal numbering issues. Fee: 4 days \$US2,495; 3 days \$US1,895; Day 4 only \$US995. Enquiries — IIR Conferences Tel: +852 549 5618 Fax: +852 547 3836.

**21-25 Australian Data Communications**, Hotel Nikko, Sydney. A two-session course staged by Housley Computer Communications covering all aspects of the Australian data communications environment. The first three days constitute an introductory course and the last two days cover advanced topics. Also to be held in Melbourne, 5-9 December. Fees: Introductory Course, \$1,315; Advanced Course \$875; Combined \$1,965. Enquiries — Tel: (02) 499 2666 Fax: (02) 498 7669.

**30-1/12 Telework '94**, Sheraton Wentworth Hotel, Sydney. Organised by the Asia Pacific Telework Association, this conference has 'Managing the Change' as its theme. It will examine all aspects of teleworking. Fee: \$975. Enquiries — Tel: (02) 241 2955 Fax: (02) 241 5354.

## December

**5-7 ATNAC '94**, Hilton Hotel, Melbourne. This event incorporates the Multimedia Communications, Applications and Technology Workshop, the Australia Broadband Switching & Services Symposium, and the Australian Teletraffic Research Seminar. The theme of the conference will be 'Meeting User Needs,' and keynote speakers include Phillip Dodds, President of the Interactive Multimedia Association of the US and Leonardo Chiariglione, convener of MPEG. The registration fee for the three-day conference is \$450. Enquiries — Margaret Keegel Tel: (03) 903 2808 Fax: (03) 903 2805.

**7-11 Photonics Summer School**, Queen's College, University of Melbourne. Staged by the Australian Photonics Cooperative Research Centre, this event is designed to provide a broad coverage of the fundamental aspects of photonics technologies and deliver an overall picture of present and future developments. It commences after the conclusion of the 19th Australian Conference on Optical Fibre Technology (ACOFT-19). Fee: Students \$400; Photonics CRC Members \$900; Others \$1,375 (includes accommodation and meals at Queen's College). Enquiries — Tel: (02) 335 0930 Fax: (02) 335 0910.

## January 1995

**22-26 PTC'95**, Sheraton Waikiki Hotel, Honolulu. The 17th Annual Pacific Telecommunications Conference has the theme of 'Convergence — Closing the Gap,' and will explore the convergence of technologies and the change this is bringing about in organisations, countries and industry sectors. Enquiries — PTC Tel: +1 808 941 3789 Fax: +1 808 944 4874.

## February

**20-23 Inter Comm 95**, Trade and Convention Centre, Vancouver. This year's conference has the umbrella theme 'Global Communications in the 21st Century.' Special topics under discussion include advances in wireless technology, global and corporate information networks, and cabling issues for voice, data and image. A large trade exhibition will accompany the conference. Enquiries — Tel: +1 604 669 1090 Fax: +1 604 682 5703.

## March

**8-15 CeBIT '95**, Hannover Fairground, Germany. Germany's famous technical trade show will feature close on 6,000 exhibitors in 1995, in many fields, including: information technology, telecommunications, software development, computer-integrated manufacturing, office equipment, banking technologies and research services. Enquiries — German Australian Chamber of Industry and Commerce Tel: (02) 261 3982 Fax: (02) 267 3807.

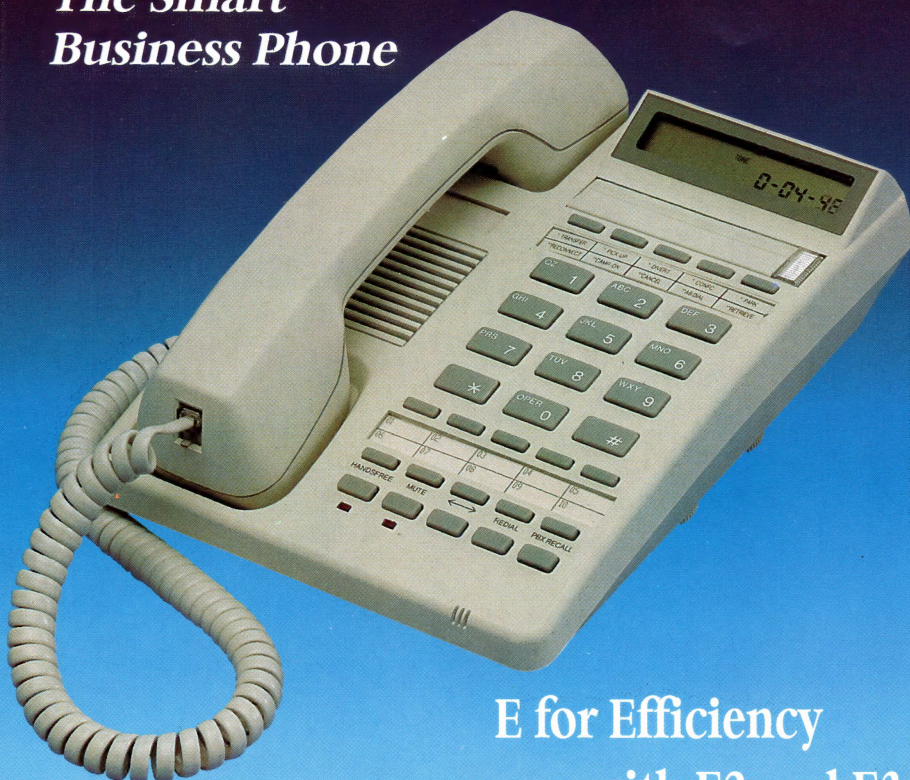
**20-22 The 1995 Pan Asia Satellite and Cable Television Conference and Exhibition**, Hong Kong Convention and Exhibition Centre, Hong Kong. Now in its fifth year, this event is focused on the business opportunities in cable service provision throughout the Asia region. There will also be an exhibition accompanying the convention featuring a range of the latest hardware and software. Fee: \$US1,795 (if registered before September 1). Enquiries — AIC Conferences Tel: +852 520 1481 Fax: +852 866 7340.

## April

**20-23 Biz-Comm Malaysia**, Putra World Trade Centre, Kuala Lumpur. This exhibition will feature all facets of communications, from mobile phones to cabling systems, modems, transmission equipment and networking and data processing equipment. Enquiries — Lines Exposition & Management Services Tel: +60 3 982 8359 Fax: +60 3 981 1951.



## The Smart Business Phone



E for Efficiency  
with E2 and E3

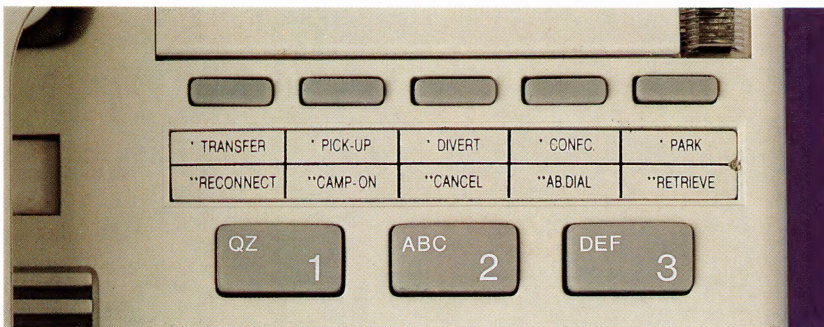
### IQTEL E3

- Liquid crystal display
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### IQTEL E2

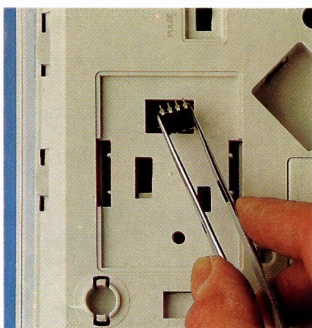
On Hook / Monitor Dialling Version

The following feature is optional



These phones not only look good, they will help you through the business day.

Easy to identify, easy to use  
PABX or carrier network facilities.



We fit this optional, specially masked Eeprom, permanently pre-programmed with your PABX or carrier network facilities

Maybe it is just checking the time or a telephone number being dialled from the display, talking handsfree or dialling on hook, phoning a colleague with one key touch or instructing the PABX or carrier network facilities to "call forward" your calls by one touch of a memory key. Whatever your job is, you will find E2 or E3 a very dependable workmate.

E2 and E3 can be purchased with customised pre-programming of PABX or network services such as Centel/Customnet/Centrex facilities as illustrated on the left of this page. The pre-programming is on a permanent basis, and will result in all staff being able to easily identify and use the PABX or Carrier facilities. The training time of staff in telephone feature use can be greatly reduced or even eliminated with E2 and E3.

E2 and E3 are not only business phones, they are ideal for home use when purchased with Telecom's "Easy Call" facilities pre-programmed into Eeprom memory for one touch activation.

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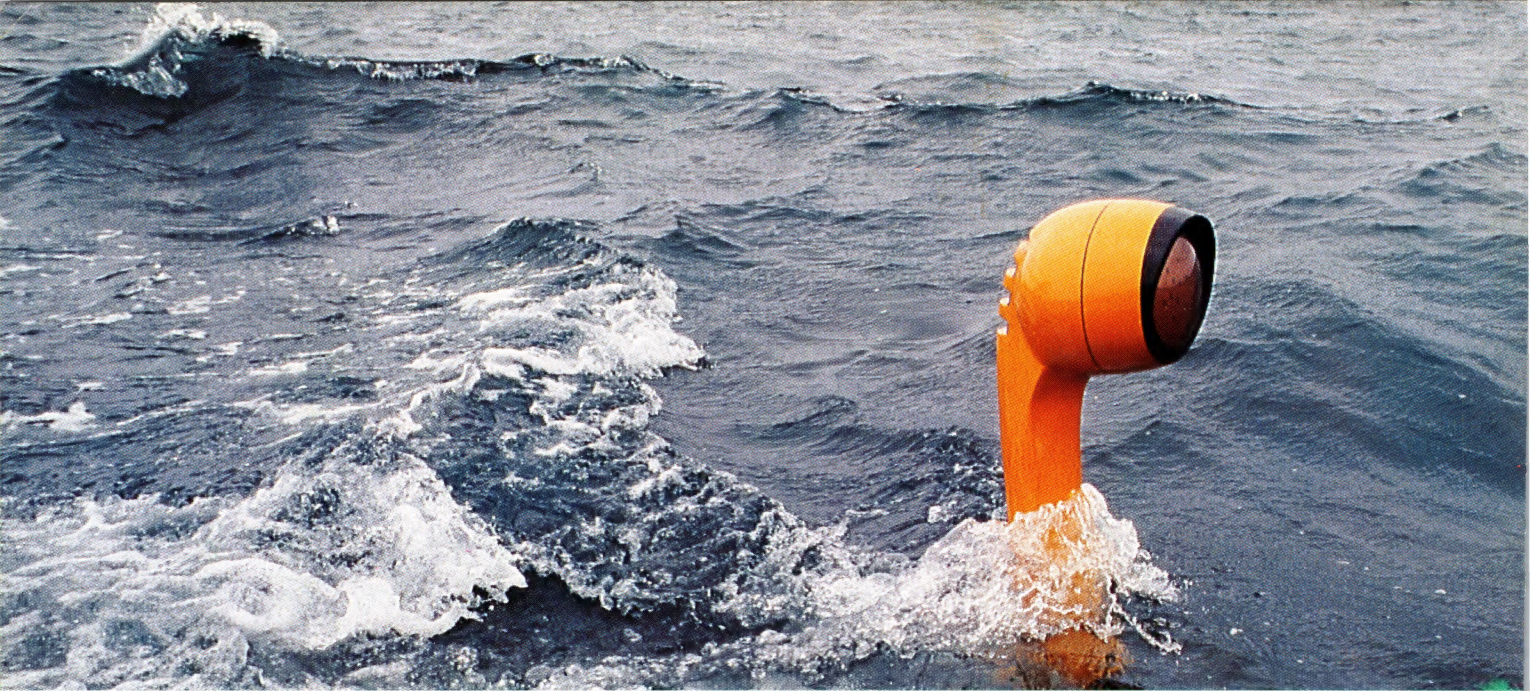
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# What we've sunk into the Pacific is earning millions for Australia.

Alcatel is helping to ring the South Pacific with thousands of kilometres of optical fibre submarine cable. Most recently these cable systems were laid on the seabed linking Australia with the USA and Europe.

Another cable stretching from Australia to Guam will complete the South Pacific network. Some 16,500 km in all, it's helping Australia get better connected with the rest of the world. These cable systems carry up to 100,000 telephone calls simultaneously. And because Alcatel is making more and more for world markets, it signals not just a new era in communications, but also a multi-million dollar boost for Australia's economy.

So while you can't exactly see the work we're doing, the benefits are sure to surface.

Alcatel Australia. We're Australia's largest communications company because we know how to compete worldwide.

